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Draft Environmental Impact Statement Ideal Basic Industries: Cement Plant, Theodore Industrial Park, Alabama and Limestone Quarry, Monroe County, Alabama Appendices, Volume II. Appendix B

U.S. Environmental Protection Agency, Atlanta, Ga. Region IV

19 May 78

DRAFT
ENVIRONMENTAL IMPACT STATEMENT
IDEAL BASIC INDUSTRIES

CEMENT PLANT
THEODORE INDUSTRIAL PARK, ALABAMA

LIMESTONE QUARRY
MONROE COUNTY, ALABAMA

APPENDICES
VOLUME II

APPENDIX B BASELINE

CLIMATOLOGY AND DISPERSION METEOROLOGY
AIR QUALITY
NOISE LEVELS
SOLID WASTE
GEOTECHNICAL ASPECTS
WATER RESOURCES
ARCHAEOLOGY

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, REGION IV

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Ideal Basic Industries proposes to construct a new cement plant in Theodore Industrial Park near Mobile, Alabama and a supporting limestone quarry in Monroe County Near Monroeville, Alabama. This impact statement addresses the existing air quality in Mobile County and Theodore Industrial Park and the natural environment of the proposed quarry sites. Air emissions at the proposed plant site are modeled and their impacts are projected for the area. The impact of constructing an access road across wetlands are discussed. Mitigative measures to reduce these impacts are presented as well as alternative locations.

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APPENDIX B. BASELINE

INTRODUCTION

The purpose of this section is to present a detailed description of the 1977 baseline conditions and projected 1992 conditions at the plant and quarry sites. The descriptions of the 1977 baseline environment are based on the results of extensive data gathering and field work conducted during 1977.

The baseline conditions at the plant and quarry sites are presented for nine areas: climatology and meteorology, air, noise, solid waste, geotechnical, water resources, archaeology, terrestrial and aquatic ecology, and socioeconomics. For applicable areas (air, noise, water resources, ecology, and socioeconomics), the projected conditions in 15 years (the 1992 baseline conditions without the proposed action) are also presented.

The descriptions of baseline conditions presented in these appendix sections are critical to the EIS process as they serve as the basis for evaluating the impacts of the proposed action.

APPENDIX B. BASELINE
CLIMATOLOGY AND DISPERSION METEOROLOGY

PLANT SITE

INTRODUCTION

Mobile is located on the western bank and at the head of Mobile Bay, 45 kilometers (28 miles) north from the Gulf of Mexico. These water bodies greatly moderate the city's temperatures, giving the area a subtropical coastal climate. Locations further south of Mobile, such as the Theodore Industrial Park, are closer to the Gulf and have the potential for slightly more temperature moderation than urban Mobile.

The source of climatological data for the proposed plant site area is Bates Field, where data have been collected since 1941. Bates Field is located 19 kilometers (12 miles) west of Mobile, within 24 kilometers (15 miles) of the Theodore Industrial Park site.

CLIMATOLOGICAL FEATURES

Temperature

Monthly average temperatures at Mobile range from 27°C (82°F) in July and August to 11°C (51°F) in January (Table B.C.1). There is an average of 19 freezing nights per year. The average date of the first freeze is December 10, and the average date of the last freeze is February 17. Temperatures of at least 32°C (90°F) occur an average of 81 days per year.

Precipitation

The average precipitation per year is 1,701 millimeters (67 inches), with slightly more rainfall during the summer and slightly less in the autumn. Summertime rainfall is largely in the form of short-lived, convective-type showers and thundershowers. These are formed by high ambient temperatures and copious amounts of moisture in the atmosphere during these months. The maximum monthly precipitation of recent record is 490 millimeters (19 inches); the maximum and minimum annual totals are 2,300 millimeters (91 inches) and 1,076 millimeters (42 inches), respectively. Almost all precipitation in Mobile is in the form of rain; however, the recent winters of 1958, 1971, 1973, and 1977 have experienced at least a trace of snow. Daily rainfall exceeding 2.5 millimeters (0.1 inches) occurs an average of 124 days per year.

Wind

Long-term records in Mobile show semi-annual changes in wind patterns between the moist, warm months and the dry, cooler months. North winds prevail in the winter, but in all except the most severe winters there are moderate stretches of southerly winds when mild weather prevails. Summer winds are predominantly from the south with both sea breeze circulations and synoptic scale flow affecting the coastal areas. The major synoptic flow is the clockwise flow around a large summertime ridge which generally is centered off the mid-Atlantic coastline. The

Table B.C.1. Climatological Data, National Weather Service Office, Bates Field, Mobile, Alabama; 1941 through 1970

Month	Wind			Precipitation						Temperature					
	Prevail-ing Direction*	Mean Speed†		Mean		Maximum††		Minimum††		Average		Maximum††		Minimum††	
		Knots	(mph)	mm	(inches)	mm	(inches)	mm	(inches)	°C	(°F)	°C	(°F)	°C	(°F)
January	N	9.3	(10.7)	120	(4.71)	237	(9.35)	25	(0.98)	10.7	(51.2)	29	(84)	-13	(8)
February	N	9.6	(11.0)	121	(4.76)	229	(9.01)	33	(1.31)	12.2	(54.0)	28	(82)	-12	(11)***
March	N	9.7	(11.2)	180	(7.07)	396	(15.58)	15	(0.59)	15.2	(59.4)	32	(90)	-12	(11)
April	S	9.2	(10.6)	142	(5.59)	449	(17.69)	12	(0.48)	19.9	(67.9)	33	(92)	2	(36)
May	S	7.8	(9.0)	115	(4.52)	284	(11.17)	11	(0.45)	23.8	(74.8)	38	(100)	6	(43)
June	S	6.9	(7.9)	155	(6.09)	332	(13.07)	30	(1.19)	26.8	(80.3)	39	(102)	13	(56)
July	S	6.1	(7.0)	225	(8.86)	490	(19.29)	55	(2.16)	27.6	(81.6)	40	(104)	16	(60)
August	NE	6.0	(6.9)	176	(6.93)	306	(12.05)	60	(2.35)	27.5	(81.5)	39	(102)	15	(59)
September	NE	7.0	(8.1)	167	(6.59)	346	(13.61)	15	(0.58)	25.3	(77.5)	37	(98)	6	(42)
October	N	7.3	(8.4)	65	(2.55)	171	(6.72)	1	(0.03)	20.5	(68.9)	34	(93)	0	(32)
November	N	8.2	(9.5)	86	(3.39)	347	(13.65)	6	(0.25)	14.7	(58.5)	31	(87)	-5	(22)
December	N	8.9	(10.2)	150	(5.92)	289	(11.38)	37	(1.45)	11.6	(52.9)	27	(81)	-12	(10)
Annual	N	8.2	(9.4)	1701	(66.98)	2299	(90.53)	1077	(42.35)**	19.7	(67.4)	40	(104)	-13	(8)

*--14-year averaged data, 1963-1976.

†--38 years of data analyzed, 1949-1976.

**--37.15 inches was recorded for 1938.

††--35-year averaged data, 1942-1976.

***--1899 lowest temperature on record (-1°F).

Source: U.S. National Climatic Center, 1976.

yearly average wind speed is 8.2 knots, with a maximum of 9.7 knots in March and a minimum of 6.0 knots in August.

Table B.C.1 summarizes the monthly temperature, precipitation, and wind patterns. Five-year average seasonal and annual hourly wind roses for Mobile are presented in Figures B.C.1 and B.C.2.

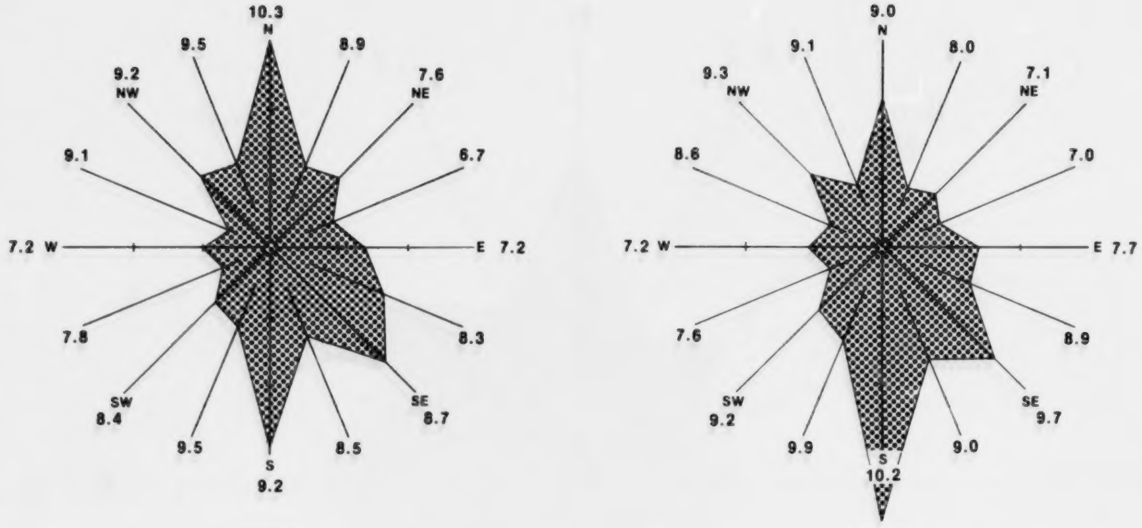
Relative Humidity

Annual average relative humidity ranges from 85 percent in early morning to 57 percent during the afternoon. There is a small seasonal change in relative humidity values with the maximum occurring in midsummer and the minimum values occurring in late winter and early spring. Dense fog occurs on an average of 39 days per year. Because it is directly on the Bay, the Theodore Industrial Park very likely will experience several more fogs per year than Bates Field, where the records were taken. Relative humidity and dense fog data are summarized in Table B.C.2.

Severe Storms

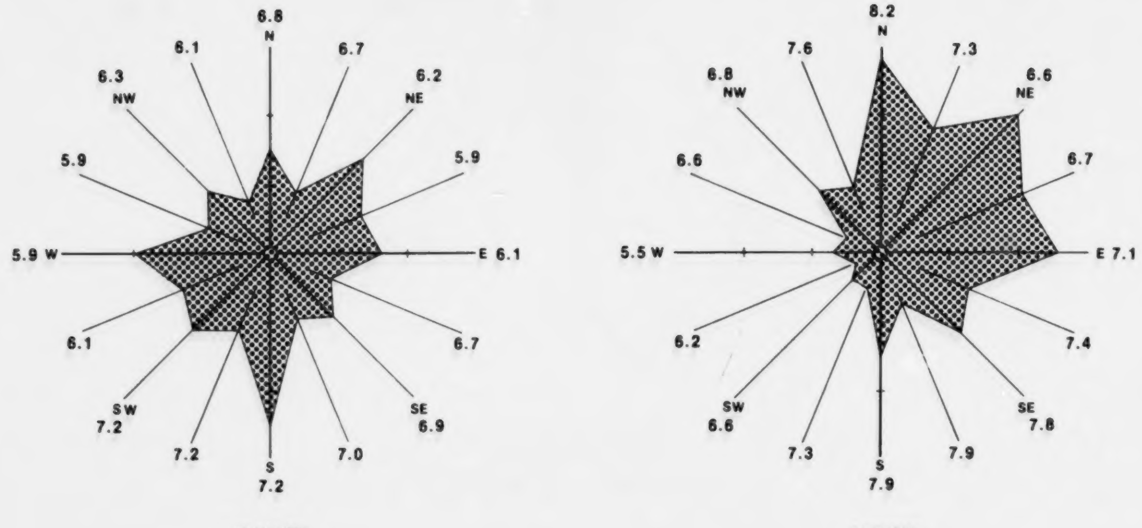
Thunderstorms are the most frequent of severe storms, occurring an average of 80 days per year. Most storms (55 percent) occur from June through August, triggered by either moisture and heat convection within a tropical air mass or by nearby frontal systems (squalls), or frequently a combination of both.

Tropical cyclones, more specifically hurricanes, have invaded southern Alabama very infrequently during this century. Most of the recent Gulf hurricanes have continued westward of this area or have veered northeastward into the Florida panhandle. From data compiled by Simpson and Lawrence (1971), the probability that a tropical cyclone will enter the area surrounding Mobile Bay is one in five years. The probability that an invading tropical storm will be of at least hurricane intensity [wind speeds greater than 117 kilometers (73 miles) per hour] is nearly 70 percent.



WINTER
CALM - 4.1%

SPRING
CALM - 4.4%



SUMMER
CALM - 9.8%

AUTUMN
CALM - 8.4%

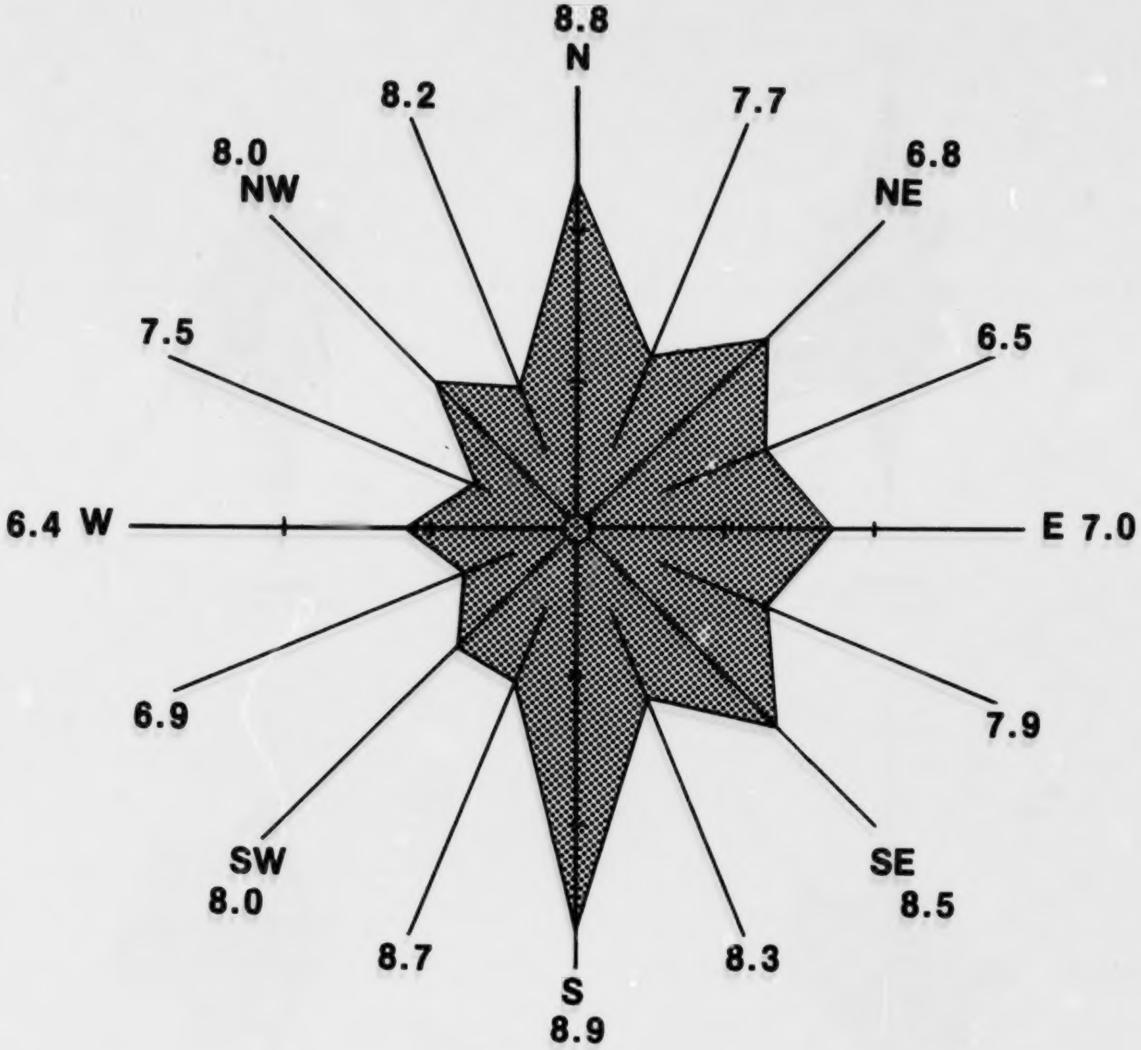
Figure B.C.1
FIVE-YEAR AVERAGE SEASONAL WIND ROSES, MOBILE ALABAMA, 1971-1975

SCALE: EACH TICK MARK REPRESENTS 4%
AVERAGE SPEEDS GIVEN IN KNOTS

SOURCE: Environmental Science and Engineering, Inc., 1977.

REGION IV
U.S. ENVIRONMENTAL PROTECTION
AGENCY ENVIRONMENTAL IMPACT
STATEMENT FOR IDEAL BASIC INDUSTRIES

PROPOSED CEMENT MANUFACTURING
PLANT THEODORE INDUSTRIAL PARK
MOBILE, ALABAMA



ANNUAL
CALM - 6.68%

Figure B.C.2
FIVE-YEAR AVERAGE ANNUAL WIND ROSE, MOBILE, ALABAMA, 1971-1975

SCALE: EACH TICK MARK REPRESENTS 4%
AVERAGE SPEEDS GIVEN IN KNOTS

SOURCE: Environmental Science and Engineering, Inc., 1977.

REGION IV
U.S. ENVIRONMENTAL PROTECTION
AGENCY ENVIRONMENTAL IMPACT
STATEMENT FOR IDEAL BASIC INDUSTRIES

PROPOSED CEMENT MANUFACTURING
PLANT THEODORE INDUSTRIAL PARK
MOBILE, ALABAMA

Table B.C.2. Mean Relative Humidity and Dense Fog Occurrences, Bates Field, Mobile, Alabama

Month	Humidity (percent)* (local time)				Fog †
	0000	0600	1200	1800	Days of Occurrence
January	80	82	63	71	6
February	77	81	55	62	5
March	80	84	56	64	5
April	83	87	54	64	5
May	83	86	53	62	2
June	84	86	54	65	1
July	86	89	60	71	1
August	87	90	61	73	1
September	86	88	60	72	2
October	82	85	52	67	2
November	82	85	55	70	4
December	81	84	62	73	5
Annual	83	85	57	68	39

*--14-year record, 1963-1976.
†--35-year record, 1942-1976.

Source: U.S. National Climatic Center, 1976.

There were 20 reports of tornadoes in the vicinity of Mobile over the 13-year period from 1955 to 1967 (Pautz, 1969). Tornadoes are most frequent in March and April.

Dispersion Meteorology

The pollutant dispersion potential of a region is often an inherent characteristic of the local climatology, as temperature and precipitation are characteristics which vary from region to region. The ability of the atmosphere to disperse emitted material horizontally from a given release point is dependent on the wind direction variability and mean wind speed. In order to know how emitted material disperses vertically (by rising or sinking), information concerning the atmospheric temperature stratification (atmospheric stability) must be known.

The stability classes of Pasquill and their percentage occurrence in Mobile during a 5-year period are described in Table B.C.3. Classes D and E are represented over 80 percent of the time, whereas Class A stability occurs less than 1 percent of the time.

The dispersion capabilities of a region are affected by the frequency and kinds of inversions. An inversion is an increase in air temperature with height in the atmosphere. This stratification, with the cooler, denser air lower in the atmosphere, is thermodynamically stable, and there is no vertical mixing of layers. There are several types of inversions, but only one type is common at Mobile.

Nocturnal or radiation inversions are frequent in Mobile. They are the least serious type of inversion because they last only during the nighttime hours and because they normally reach only 100 to 200 meters (300 to 650 feet) above the ground. Effluents released above the shallow inversion cannot descend through it. If the inversion does extend above a stack, the effluent plume will neither rise nor descend but will fan out horizontally within one of the stable strata forming the inversion.

Table B.C.3. Percent Frequency of Occurrence of Pasquill's Stability Classes, 1971-75, Mobile, Alabama

Stability Class	Season 1	 2	 3	 4	 5
A	0.03	0.61	2.30	0.31	0.82
B	2.04	5.09	10.31	5.96	5.87
C	7.16	11.16	18.34	13.00	12.44
D	61.82	53.20	24.97	36.87	44.15
E	28.94	29.93	44.08	43.86	36.72

Seasons Legend:

1 - December, January, February
2 - March, April, May
3 - June, July, August
4 - September, October, November
5 - Annual

Stability Class Definitions (Pasquill, 1961):

A - Extremely unstable conditions with strong super adiabatic lapse rate, greater turbulence, mixing.
B - Unstable, moderate mixing.
C - Slightly unstable, usually moderate wind speeds, minimal turbulence.
D - Neutral, approximately dry adiabatic lapse rate.
E - A combination of Pasquill's classes "E" through "G," from conditionally unstable through inversion conditions.

A noctural inversion is formed on a clear, calm night. Air is a poor heat conductor, and heat radiated from the ground will pass directly out into space without heating the air. Cooler, denser air, initially only a few meters thick, forms at the surface, and the inversion gradually builds to include higher air levels. At Mobile, these shallow nocturnal emissions occur during nearly 40 percent of all hours in spring and summer (Hosler, 1961).

A more serious type of inversion, subsidence inversion, occurs quite infrequently at Mobile. Unlike nocturnal inversions, subsidence inversions form in the upper air and act as a thermodynamic lid on the upward mixing of effluents. Also, they are not broken up by sunshine and may persist for days. In the eastern United States, they are most commonly formed by the heating of descending cool air. The air reaches a stable level, and an inversion is formed. Up to the mixing height, the distance from the ground to the inversion, air can freely mix, but it is confined within the area so that car and industrial emissions build up. This general type of inversion is responsible for occasional serious air pollution buildups in California.

According to Holzworth's (1972) forecasts of air pollution potential (Figure B.C.3), Mobile would experience fewer than 20 days of subsidence inversion in any 5-year period. The nearest station for which mixing height data are available is Burrwood, Louisiana. These data are presented in Table B.C.4.

Other inversions occur either to a lesser degree or for very brief periods of time. A frontal system may cause a build-up of effluent concentrations for a few hours. This is called trapping and is usually experienced only during the late fall or winter when cooler air masses invade the state. Trapping can produce high pollutant concentrations for very brief periods.

A fumigation (downwash) condition can be created by the break-up of an inversion layer from below by sunshine hitting the surface; however,

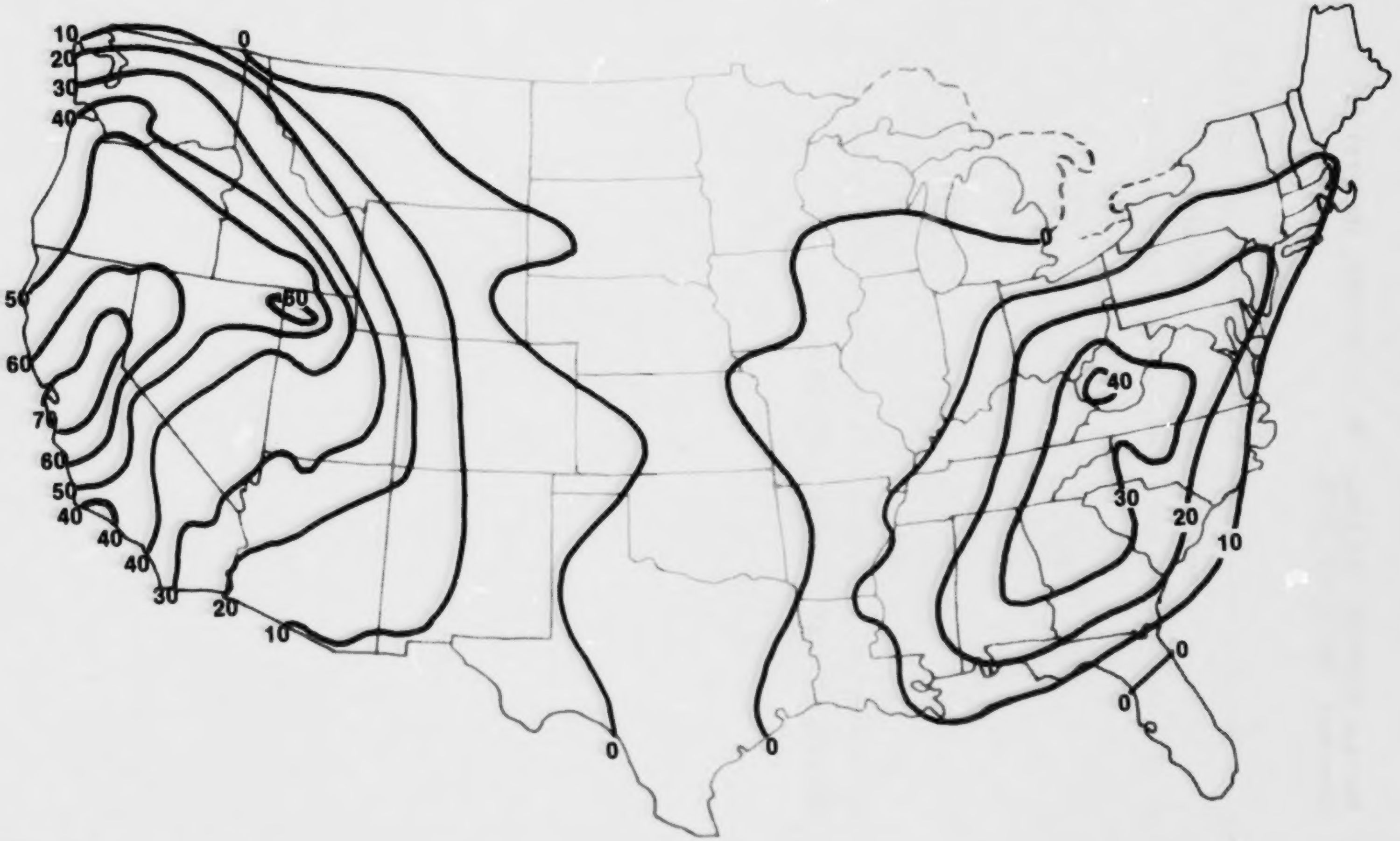

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Figure B.C.3
ISOPLETHS OF THE TOTAL NUMBER OF FORECAST DAYS OF HIGH METEOROLOGICAL POTENTIAL FOR AIR POLLUTION IN A FIVE-YEAR PERIOD

SOURCE: Environmental Science and Engineering, Inc., 1977.

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AND PROPOSED GAILLARD QUARRY

Table B.C.4. Average Seasonal and Annual Mixing Heights (Meters) for Burrwood, Louisiana, 1971-75

Season	Morning	Afternoon
Winter	229	678
Spring	351	1083
Summer	438	1474
Autumn	244	1038
Annual	335	1073

Source: U.S. National Climatic Center, 1971-1975.

these conditions are usually very brief, lasting no more than 45 minutes. Longer fumigations are sometimes induced by afternoon sea breezes when the stable, cooler air from over the sea surface moves ashore where the surface is hot. The surface heats the cool layer from below, causing low-level mixing to occur while the upper level air remains stable and prevents upwards mixing. Mobile will experience this phenomenon mostly during the summer months.

Both sea breeze and land breeze circulations contribute to the ventilation and dispersion of emitted material. Sea and land breezes can be brought about by synoptic-scale weather patterns such as highs, lows, or frontal systems, but it is more appropriate to discuss the smaller scale phenomena which take the form of true vertical circulations over most coastal areas.

Mesoscale influences affecting Mobile increase greatly in the summer season. Sea breezes created by very localized temperature and density gradients are established along the coastline because of the much greater heat capacity of the sea as opposed to the land. The cooler sea air is denser and sinks, while the hotter land air rises. From continuity of mass considerations only, surface air will flow from the sea onto land. A return flow at some upper level will complete the vertical circulation.

While mesoscale breezes help cleanse the air through dilution of emitted material, several situations have been observed where emitted material, once caught in a sea breeze, has been recirculated toward its point of release.

QUARRY SITE

Located approximately 108 kilometers (67 miles) northeast of Bates Field, the Ideal Basic Industries quarry site is in an area for which few meteorological data are presently available.

Being further from the Gulf of Mexico, the quarry site experiences fewer sea breezes, lower dew points, and substantially less summertime rainfall than the plant site. Monthly averages of temperature and precipitation data available from nearby sources are presented in Table B.C.5. Bates Field is the nearest source of other climatological records (see Tables B.C.1 and B.C.2).

For the quarry site, the mean monthly temperature varies from 8.9°C (48.8°F) in January, to 26.9°C (80.5°F) in July. The mean annual temperature is 18.3°C (65°F). As at the plant site, precipitation is fairly evenly distributed throughout the year with a small October minimum. The annual rainfall total of 1,519 millimeters (59.81 inches) is over 178 millimeters below the Bates Field total, due almost entirely to reduced summertime showers from June through September.

Table B.C.5. Monthly Averages of Temperature and Precipitation for the Ideal Basic Industries Quarry Site, 1941-70

Month	Temperature*		Precipitation†	
	°C	°F	Millimeters	Inches
January	8.9	48.8	124	4.88
February	10.6	51.1	121	4.76
March	13.9	57.0	169	6.65
April	18.6	65.5	134	5.27
May	22.6	72.7	103	4.06
June	25.9	78.7	129	5.06
July	26.9	80.5	173	6.81
August	26.8	80.2	121	4.75
September	24.2	75.6	123	4.86
October	18.7	65.6	70	2.76
November	12.8	55.0	113	4.46
December	9.7	49.5	139	5.49
ANNUAL	18.3	65.0	1,519	59.81

* Temperature data taken from U.S. National Climatic Center, 1970, (ALABAMA) for Evergreen, Alabama, 1941-70.

† Precipitation data taken from U.S. National Climatic Center, 1970, (ALABAMA) for Frisco City, 1941-70.

APPENDIX B. BASELINE

AIR QUALITY

INTRODUCTION

This section describes the existing air quality at the plant and quarry sites. Sources of atmospheric emissions and long-term measured trends in air quality levels are presented. In addition, the spatial distribution of pollutants of concern in the vicinity of the sites is estimated. The applicable ambient air quality standards for Mobile and Monroe counties and the pollutants and regulations of concern for the Ideal Basic Industries plant and quarry sites are described in Appendix A.

MOBILE COUNTY AND THE PROPOSED PLANT SITE

EXISTING ENVIRONMENT (1977)

Emission Sources

Mobile County is a highly industrialized, highly populated area located on Mobile Bay. Several major sources of air pollution are located in Mobile County. During 1976, over 180 point sources were permitted either to operate or to construct. These sources emitted approximately 79,800 metric tons (88,000 tons) of sulfur dioxide and 6,800 metric tons (7,500 tons) of particulate matter (U.S. National Emissions Data Systems, 1976).

Major stationary sources of air pollution include electric power plants, several paper mills, petroleum refineries, a cement plant, and various chemical factories. Major industrial areas in the county include the City of Mobile along the Mobile River; Theodore, to the south; Plateau, just north of Mobile along the Mobile River; and Salco, several miles north of Mobile.

The population of Mobile County is concentrated in Mobile and surrounding suburbs. Activities associated with this population add 4,500 metric tons per year (5,000 tons per year) to suspended particulate matter emissions.

The only major air pollution sources near the proposed plant site are located in the Theodore Industrial Park (Figure B.A.1). Emissions include particulate matter from a metallurgical processing plant (Airco) and both particulate matter and sulfur dioxide from a petroleum refinery (Marion Refinery) and two chemical plants (Degussa and Kerr-McGee). Some of these plants also emit pollutants for which Ambient Air Quality Standards (AAQS) have not been set.

Currently, all except three air pollution sources in Mobile County are in full compliance with applicable emission regulations (Herrin, 1977).

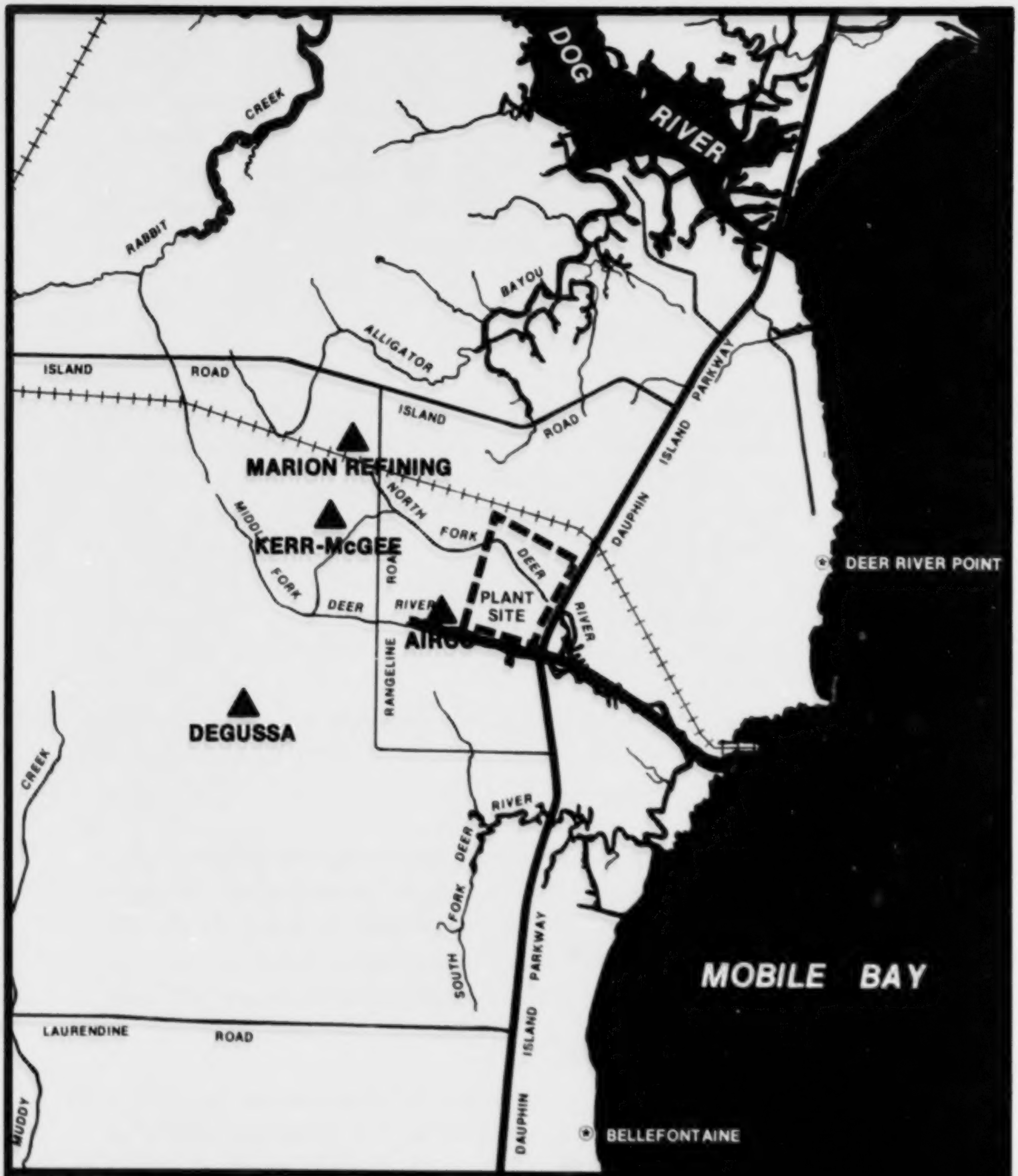
DOG RIVER
RABBIT CREEK
BAYOU
ALLIGATOR
ISLAND ROAD
ISLAND ROAD
DAUPHIN ISLAND PARKWAY
MARION REFINING
KERR-McGEE
MIDDLE FORK DEER RIVER
NORTH FORK DEER RIVER
RANGELINE ROAD
PLANT SITE
AIRCO
RIVER
DEER RIVER POINT
DEGUSSA
CREEK
SOUTH FORK DEER RIVER
MOBILE BAY
LAURENDINE ROAD
MUDDY
BELLEFONTAINE

Figure B.A.1
MAJOR AIR POLLUTANT EMISSION SOURCES IN THE VICINITY OF PROPOSED CEMENT PLANT, THEODORE, ALABAMA

0 0.5 1
SCALE IN KILOMETERS

SOURCE: U.S. National Emissions Data Systems, 1976.

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The three exceptions are the State Docks bulk handling facility, a bark boiler at Scott Paper Company, and a sulfuric acid plant at Stauffer Chemical Company. These sources are currently under compliance schedules requiring them to reduce emissions to or below the allowable emission limit by December 31, 1978.

Measured Air Quality

Air Quality Trends (Mobile Area)

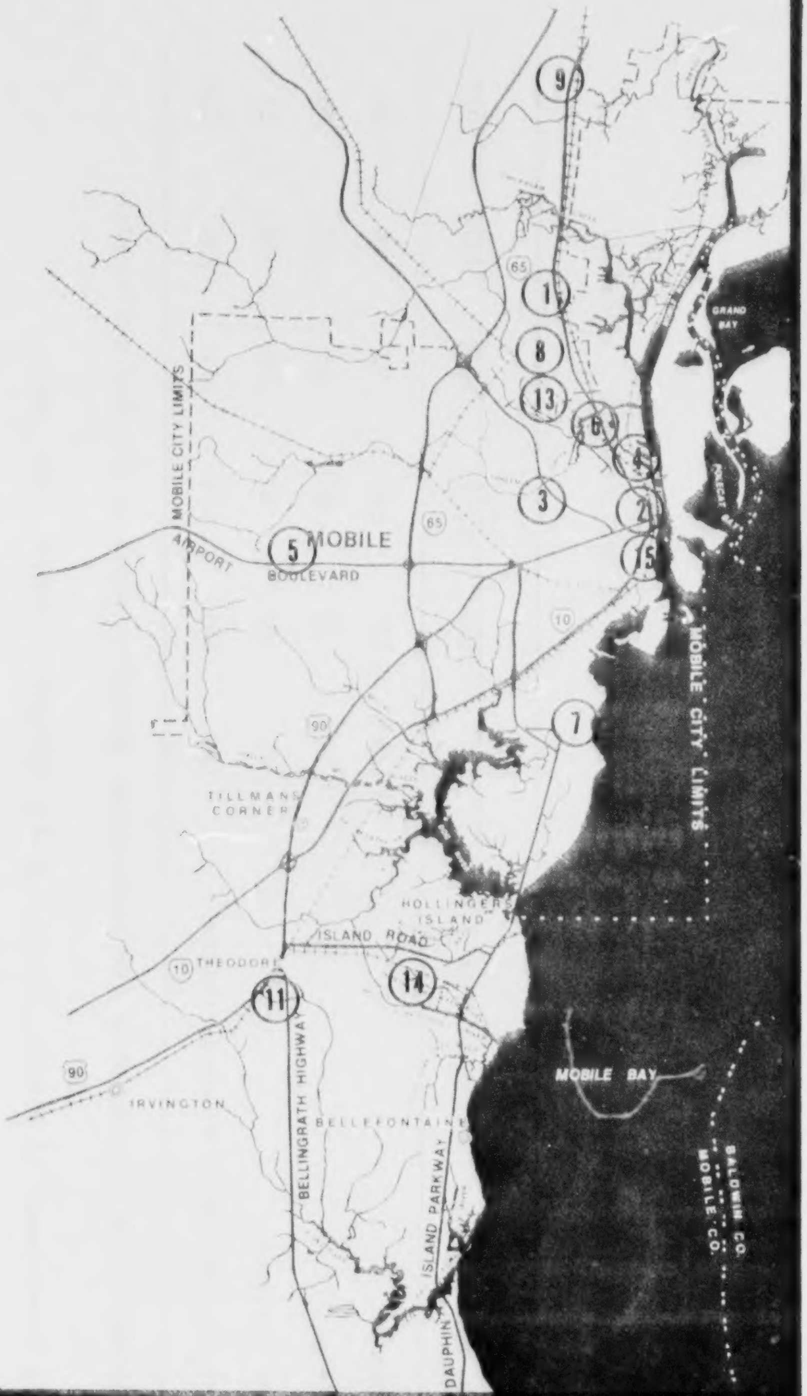
The Mobile County Board of Health, Division of Air Pollution Control, has maintained an extensive ambient monitoring program in the Mobile County area since 1972. The network was designed primarily to monitor total suspended particulate matter (TSP) and sulfur dioxide levels throughout the county, since these pollutants are of primary concern in attainment and maintenance of Federal AAQS. A limited number of stations have also monitored carbon monoxide and ozone. Most stations are operated every sixth day, but a few are operated every third day.

Statistical summaries of these data for 1972 through 1977 were provided by Mobile County. Only the TSP data were sufficient to quantify trends in ambient pollution levels in the county.

Since 1972, Mobile County has operated 24-hour ambient TSP monitors at 11 to 14 locations (Figure B.A.2). Areawide concentrations for urban and suburban sampling locations were determined by averaging the annual geometric means for all stations in each category (Table B.A.1). Stations located in the Mobile area were considered urban, and all other stations in Mobile County were designated as suburban.

Ambient TSP levels in Mobile County have displayed marked declines since 1972 (Figure B.A.3). All stations display this trend, although urban TSP levels have declined more rapidly. The average geometric mean of all stations in Mobile County has decreased to below the Primary AAQS (75 ug/m^3, annual geometric mean), but the average of the urban

1	CHICKASAW
2	CENTRAL FIRE STATION
3	BOARD OF HEALTH
4	STATE DOCKS
5	AIRPORT BOULEVARD
6	WKRG
7	BROOKLEY
8	PRICHARD A
9	SARALAND
10	AXIS (NOT SHOWN)
11	THEODORE
12	SALCO (NOT SHOWN)
13	PRICHARD B
14	BIG SNIFFER
15	LITTLE SNIFFER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AIRPORT
BOULEVARD
MOBILE CITY LIMITS
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GRAND BAY
7
90
TILLMANS CORNER
HOLLINGERS ISLAND
ISLAND ROAD
10
THEODORE
14
11
90
IRVINGTON
BELLINGRATH HIGHWAY
BELLEFONTAINE
ISLAND PARKWAY
DAUPHIN
MOBILE BAY
MOBILE CITY LIMITS
BALDWIN CO.
MOBILE CO.

Figure B.A.2
LOCATIONS OF MOBILE COUNTY HEALTH DEPARTMENT AMBIENT MONITORING STATIONS

0 1 2
SCALE IN KILOMETERS

SOURCE: Mobile County Board of Health, 1977.

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Table B.A.1. Summary of Areawide* TSP Concentration Levels (ug/m^3) in Mobile County, 1972-1977

Total Suspended Particulates (Geometric Means)	Year 1972	1973	1974	1975	1976	1977
Urban Stations	124	109	106	93	80	80
Suburban Stations	73	59	64	55	52	48
All Reporting Stations	95	82	80	73	65	63
Percentage of Stations Above Primary Standard	73%	69%	57%	31%	29%	31%

* Areawide concentrations determined by averaging annual geometric means of all stations in each category.

Source: Mobile County Board of Health, Division of Air Pollution Control, 1977, 1978.

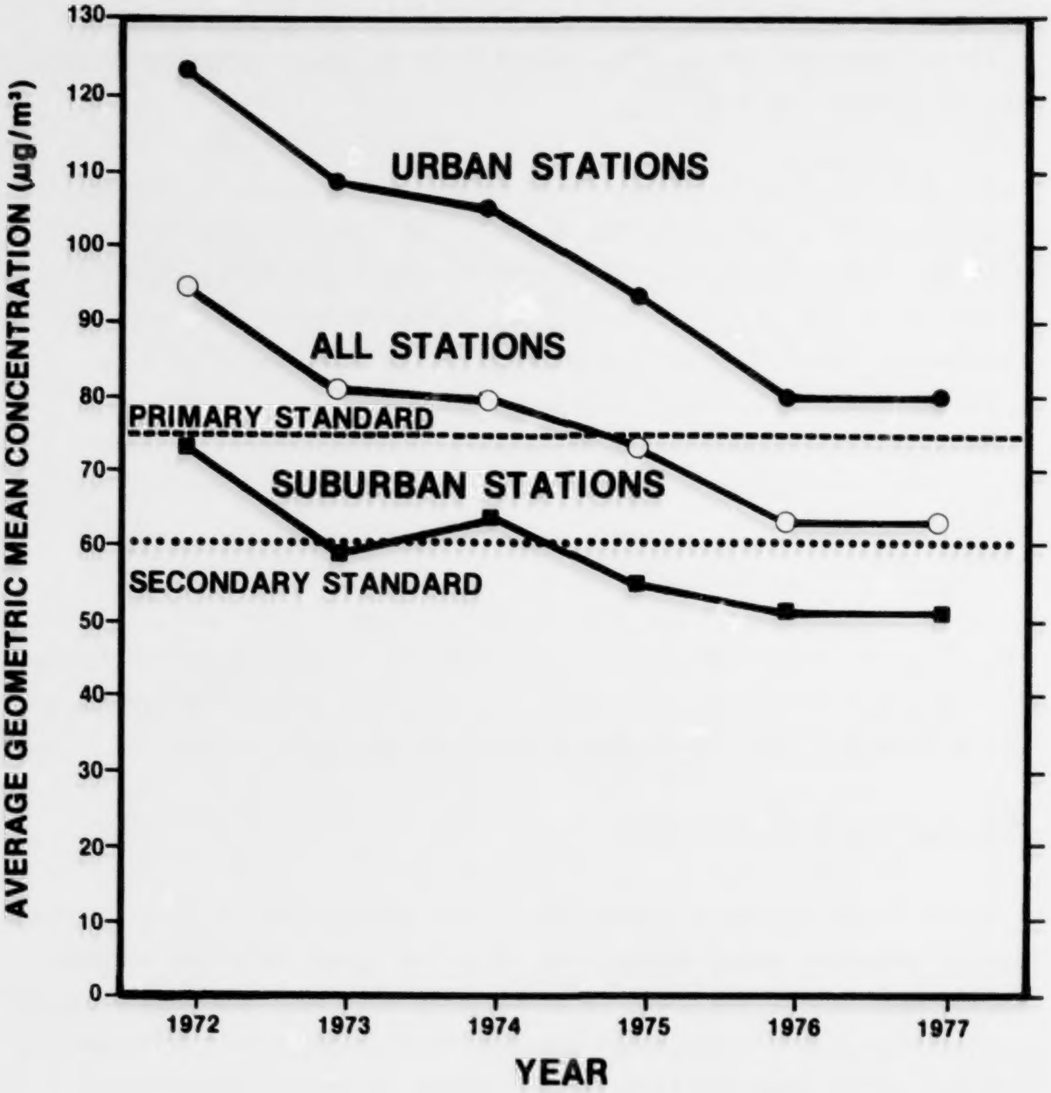

Figure B.A.3
AREAWIDE TOTAL SUSPENDED PARTICULATE MATTER, MOBILE COUNTY, 1972-1977

SOURCE: Mobile County Board of Health, 1978.

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stations was still above the Primary AAQS in 1977. A significant decline in the number of stations exceeding the Primary AAQS has also occurred since 1972 (Table B.A.1). In 1977, about 30 percent of the stations displayed levels above the Primary Standard, compared to more than 70 percent in 1972.

Because of the high TSP levels in the 1970's, Mobile County implemented an Air Quality Maintenance Plan in 1972. All sources of particulate matter in Mobile County were required to comply with emission regulations, generally by July 1, 1975. As of August, 1977, all except two stationary sources of particulate matter in Mobile County were in compliance with emission regulations.

Big Sniffer and Theodore monitoring stations are in the vicinity of the proposed plant. At the Theodore Station, 6.4 kilometers (4 miles) west of the plant site, mean TSP levels have declined by about 33 percent since 1972 (Table B.A.2 and Figure B.A.4). Present air quality is below the Secondary AAQS. The Big Sniffer Station, located about 1 kilometer (0.6 miles) west of the plant site, has measured annual TSP levels well below Secondary AAQS since monitoring began there in 1975.

Existing Levels (Mobile Area)

A total of 993 TSP measurements were taken during 1977 in Mobile County. Annual geometric means ranged from 35 to 106 ug/m^3, with the highest levels measured at the State Docks (Station 4). Four stations recorded levels in excess of the annual primary TSP standard (75 ug/m^3), and a total of six stations exceeded the annual secondary TSP standard (60 ug/m^3).

Maximum 24-hour average TSP levels ranged from 108 ug/m^3 to 350 ug/m^3. The highest measurement was again recorded at the State Docks. The 24-hour primary TSP standard (two or more values above 260 ug/m^3), Table B.A.2. Summary of Ambient Total Suspended Particulate Matter Data (ug/m^3), in the Vicinity of the Proposed Ideal Cement Plant, 1972-1977

Station	Year					
	1972	1973	1974	1975	1976	1977
Theodore						
Geometric Mean	84	70	60	56	58	56
24-Hour Maximum	379	206	167	193	148	146
24-Hour Second Max.	---	---	139	127	126	141
Big Sniffer						
Geometric Mean	---	---	---	44	48	43
24-Hour Maximum	---	---	---	127	156	161
24-Hour Second Max.	---	---	---	125	148	90

Note: Primary Standards: Annual Geometric Mean, 75 ug/m^3
24-Hour Maximum (not to be exceeded more than once per year), 260 ug/m^3
Secondary Standards: Annual Geometric Mean, 60 ug/m^3
24-Hour Maximum (not to be exceeded more than once per year), 150 ug/m^3

Source: Mobile County Board of Health, Division of Air Pollution Control, 1977.

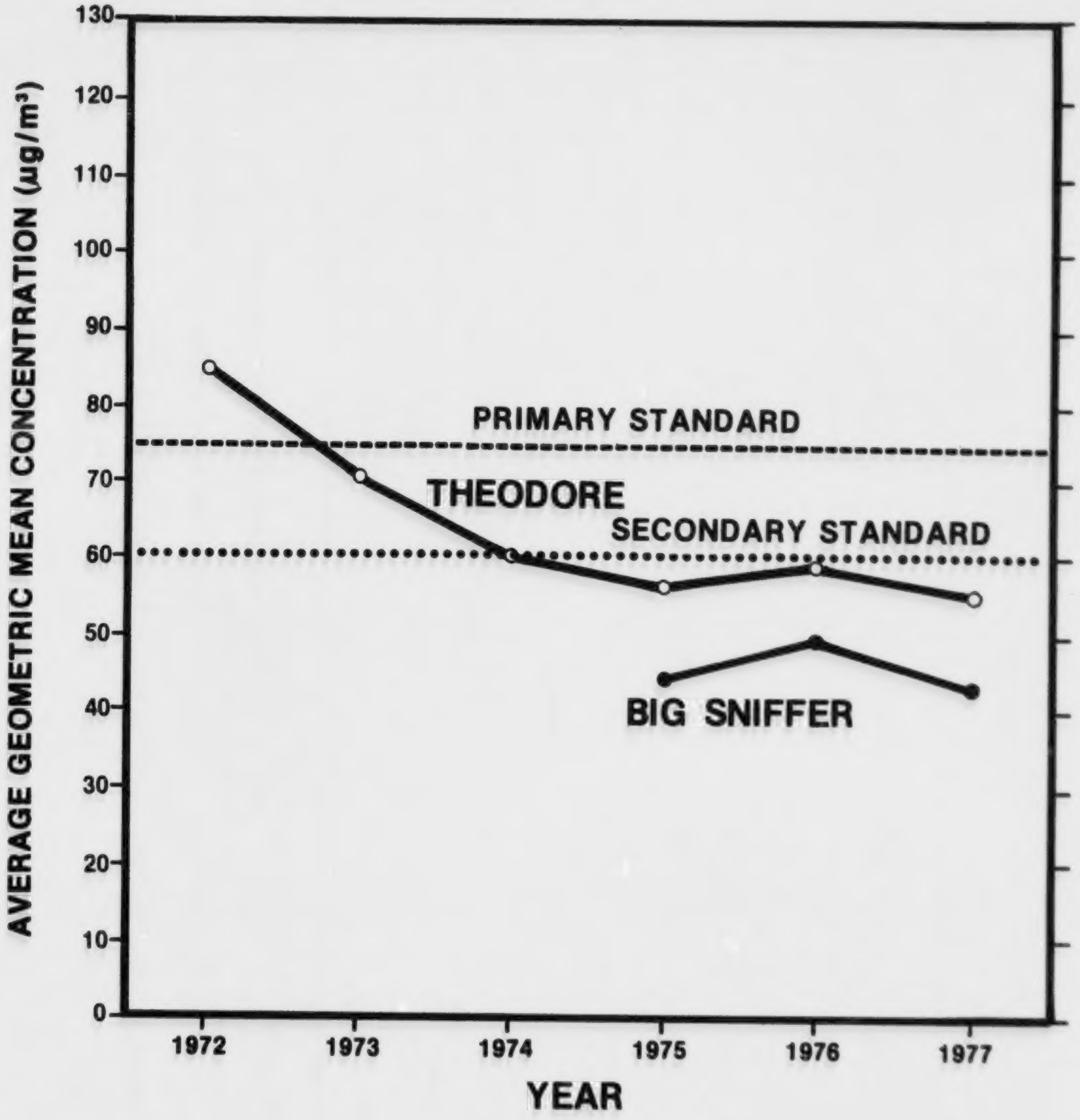

Figure B.A.4
AMBIENT TOTAL SUSPENDED PARTICULATE MATTER CONCENTRATIONS AT TWO STATIONS NEAR THE PROPOSED IDEAL CEMENT PLANT, MOBILE COUNTY, 1972-1977

SOURCE: Mobile County Board of Health, 1978.

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was not exceeded at any Mobile County station, but the 24-hour secondary standard (two or more values above 150 ug/m^3) was exceeded at three stations.

In summary, the TSP data indicate that not all of Mobile County is in compliance with the AAQS. Violations were confined generally to the downtown Mobile area. Neither station near the proposed plant site measured levels in excess of any AAQS for TSP during 1977.

Continuous ambient sulfur dioxide data are available from stations WKRG and Big Sniffer for 1977. WKRG in downtown Mobile recorded annual average sulfur dioxide levels which were about 25 percent of the primary standard (80 ug/m^3). The maximum recorded 24-hour concentration (107 ug/m^3) represented about 30 percent of the primary standard, and the 3-hour maximum (249 ug/m^3) was approximately 20 percent of the 3-hour standard. In 1977, maximum concentrations at Big Sniffer were 18 ug/m^3, annual arithmetic mean; 102 ug/m^3, 24-hour maximum; and 241 ug/m^3, 3-hour maximum. These levels are well below AAQS for sulfur dioxide. These data indicate that sulfur dioxide levels near the proposed plant site and in Mobile County are currently below the AAQS.

Continuous carbon monoxide measurements are available only from the Little Sniffer Station in downtown Mobile, and only during May and June, 1975. The maximum 1-hour concentration was 5.1 mg/m^3 which represents about 15 percent of the ambient standard. The maximum 8-hour concentration was 3.0 mg/m^3, or about 30 percent of the standard.

During 1977, limited oxidant measurements were conducted at two sites in the Mobile area. At the WKRG station, continuous data were obtained for only January through April. During this period, the one-hour oxidant standard was exceeded approximately 55 percent of the time, indicating that Mobile County had an oxidant problem in 1977. Oxidant data were also available from the Big Sniffer site for December, 1977. In this month, the oxidant standard was exceeded during only one hourly period.

Existing Levels (Plant Site Area)

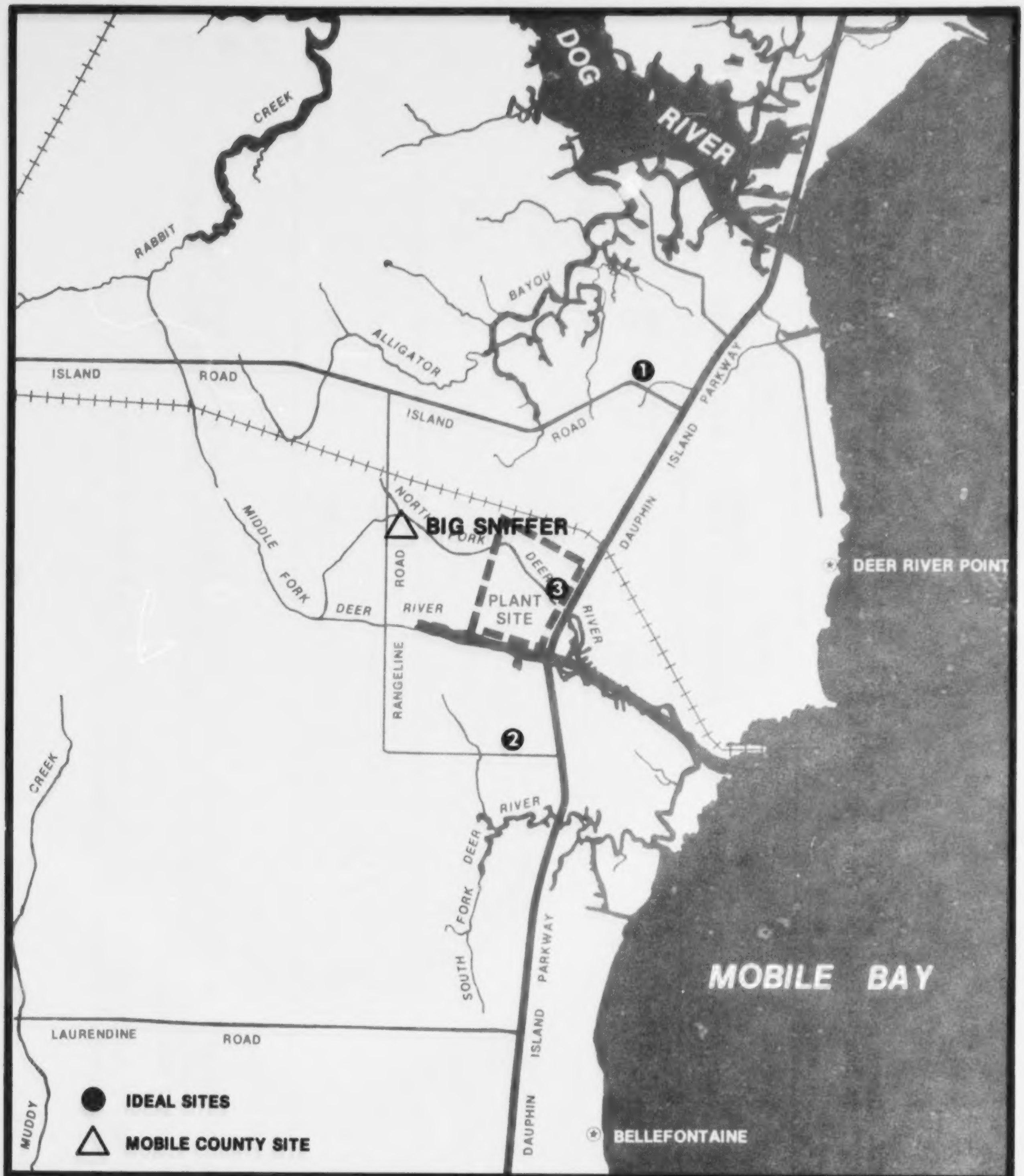
Near the proposed plant site, TSP and sulfur dioxide data are being collected by Mobile County's Big Sniffer Station. In addition, TSP samples have been collected by Environmental Science and Engineering, Inc., at three stations (see Figure B.A.5) since May 28, 1977.

For all stations, the mean TSP levels (Table B.A.3) are well below the AAQS. The highest 24-hour concentration (179 ug/m^3), which was recorded at Station 1, may have been due to a very local disturbance since the field technician who serviced the sampler reported that the weeds surrounding the station had been cut. This cutting may have generated dust emissions from the almost barren ground, thus biasing the sampling results. The second highest measurement at Station 1 (136 ug/m^3) represents 91 percent of the secondary standard.

Hourly average sulfur dioxide concentrations at the Big Sniffer station were available for all of 1977. Data recovery was 74 percent. The maximum 3-hour reading was 241 ug/m^3, and the maximum 24-hour average was 102 ug/m^3. The mean concentration level was 18 ug/m^3. These concentrations are well below the AAQS for sulfur dioxide.

Air Baseline

As required by the Clean Air Act Amendments of 1977, the State of Alabama has reviewed its geographical areas for attainment status with the National Ambient Air Quality Standards (NAAQS). Based on data obtained by the Mobile County Board of Health (summarized in the preceding sections), two areas of the county have been determined to be in nonattainment of the suspended particulate standards. The larger of the two areas, which is located in downtown Mobile, was found to be in nonattainment of the national primary ambient air quality standard for TSP. The other area, located north of Mobile, was found to be in nonattainment of the national secondary ambient air quality standards for TSP.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RABBIT CREEK
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ALLIGATOR
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ISLAND ROAD
DAUPHIN ISLAND PARKWAY
NORTH FORK
BIG SNIFFER
MIDDLE FORK
DEER RIVER
RANGELINE ROAD
DEER RIVER
PLANT SITE
DEER RIVER POINT
❶
❷
❸
MUDDY CREEK
SOUTH FORK DEER RIVER
DAUPHIN ISLAND PARKWAY
LAURENDINE ROAD
MOBILE BAY
BELLEFONTAINE
● IDEAL SITES
△ MOBILE COUNTY SITE

Figure B.A.5
LOCATIONS OF AMBIENT MONITORING STATIONS IN THE VICINITY OF THE PROPOSED CEMENT PLANT, THEODORE, ALABAMA

0 0.5 1
SCALE IN KILOMETERS

N

SOURCE: Environmental Science and Engineering, Inc., 1977.

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Table B.A.3. Summary of Existing Ambient Total Suspended Particulate Matter Levels (ug/m^3) in the Vicinity of the Proposed Ideal Basic Industries Plant Site, 1976 and 1977

					24-Hour		
Station	Description	Time Period	Number of Observations	Geometric Mean	Max	Second Highest	Standard Geometric Deviation
Mobile County #11	Big Sniffer	1976 1977	56 50	48 43	156 161	148 90	N/A 1.63
Ideal #1	Nursery	5/28/77 to 12/31/77	47*	42	179	134	1.62
Ideal #2	Weaver's Residence	5/28/77 to 12/31/77	47*	35	93	89	1.55
Ideal #3	Lift Station	5/28/77 to 12/31/77	47*	31	94	90	1.62
		Primary Standard		75		260	
		Secondary Standard		60		150	

NA = Not Available.

*Sampling and analysis by Federal Reference Method (Code of Federal Regulations, Part 50, Appendix B). Continuous 24-hour sampling was conducted every third day from May 28 to August 31, and every sixth day thereafter.

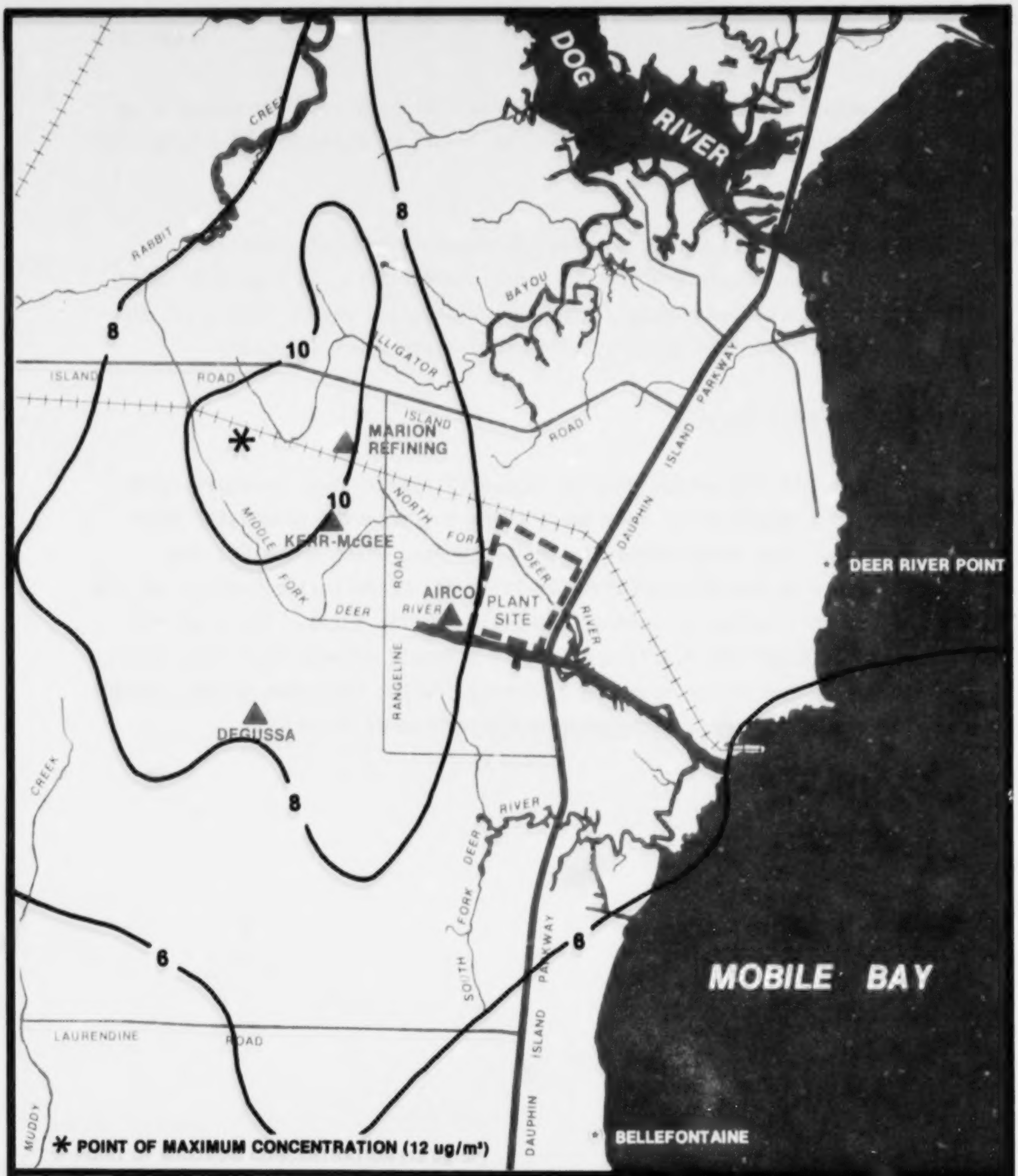
Sources: Mobile County Board of Health, Division of Air Pollution Control, 1977.
Environmental Science and Engineering, Inc., 1977.

The area surrounding the Theodore Industrial Park was determined to be in attainment for TSP, due to the low levels measured at the Big Sniffer station.

The entire Mobile County area was declared in non-attainment for oxidants due to the high levels mentioned earlier. In regard to other pollutants (sulfur dioxide, nitrogen oxides, and carbon monoxide), the county was found to be in attainment of their specific NAAQS.

Estimated Air Quality

Existing TSP and sulfur dioxide concentrations in the 100-square-kilometer (40-square-mile) area surrounding the proposed plant site were estimated from atmospheric dispersion models, using emissions data furnished by the Mobile County Division of Air Pollution Control and the Alabama Air Pollution Control Commission (1976; 1977). The isopleths (Figures B.A.6 and B.A.7) are largely a result of emissions from sources in Mobile and in the Theodore Industrial Park. Estimated annual average TSP levels include a background concentration of 35 ug/m^3.


DOG RIVER
RABBIT
CREEK
BAYOU
ALLIGATOR
ISLAND ROAD
ISLAND ROAD
MARION REFINING
KERR-McGEE
MIDDLE FORK
NORTH FORK
DEER
DEER RIVER
RANGELINE ROAD
AIRCO
PLANT SITE
DEER
RIVER
DAUPHIN ISLAND PARKWAY
DEER RIVER POINT
DEGUSSA
CREEK
RIVER
SOUTH FORK DEER
DAUPHIN ISLAND PARKWAY
MOBILE BAY
LAURENDINE ROAD
MUDDY
BELLEFONTAINE
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8
8
10
10
6
6

✱ POINT OF MAXIMUM CONCENTRATION (12 ug/m³)

Figure B.A.6
ISOPLETHS OF ESTIMATED EXISTING ANNUAL AVERAGE GROUND-LEVEL SULFUR DIOXIDE CONCENTRATIONS (ug/m^3), THEODORE, ALABAMA, 1977

0 0.5 1
SCALE IN KILOMETERS

N

SOURCE: Environmental Science and Engineering, Inc., 1977.

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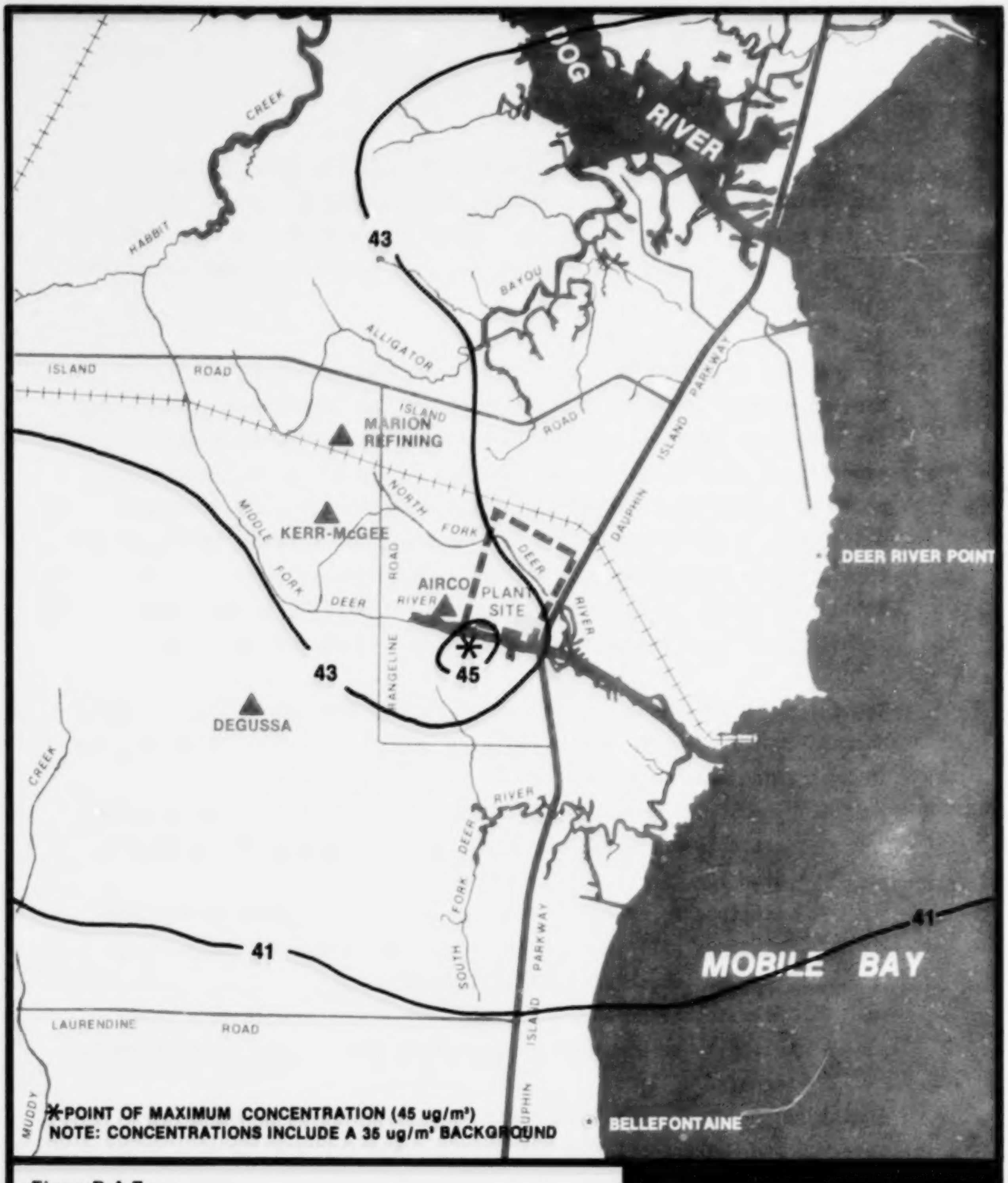
STATEMENT FOR IDEAL BASIC INDUSTRIES

PROPOSED CEMENT MANUFACTURING
PLANT THEODORE INDUSTRIAL PARK
MOBILE, ALABAMA



OG
RIVER
CREEK
RABBIT
43
BAYOU
ALLIGATOR
ISLAND
ROAD
ISLAND
ROAD
MARION
REFINING
KERR-McGEE
MIDDLE
FORK
DEER
RIVER
NORTH
FORK
DEER
RIVER
ROAD
AIRCO
PLANT
SITE
RANGELINE
45
43
DEGUSSA
CREEK
DAUPHIN
ISLAND
PARKWAY
DEER RIVER POINT
RIVER
DEER
SOUTH
FORK
PARKWAY
41
41
MOBILE BAY
LAURENDINE
ROAD
MUDDY
DAUPHIN
ISLAND
BELLEFONTAINE

✱POINT OF MAXIMUM CONCENTRATION (45 ug/m³)
NOTE: CONCENTRATIONS INCLUDE A 35 ug/m³ BACKGROUND

Figure B.A.7
ISOPLETHS OF ESTIMATED EXISTING ANNUAL AVERAGE GROUND-LEVEL SUSPENDED PARTICULATE MATTER CONCENTRATIONS (ug/m3), THEODORE, ALABAMA, 1977

0 0.5 1
SCALE IN KILOMETERS

N

SOURCE: Environmental Science and Engineering, Inc., 1977.

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PROJECTED 1992 ENVIRONMENT

Currently, no new industrial facilities (except the Ideal Basic Industries plant) have been announced for the Theodore area. Expansions at the existing Degussa and Union Carbide plants have been announced, but it is not known if these facilities will emit significant amounts of air pollutants.

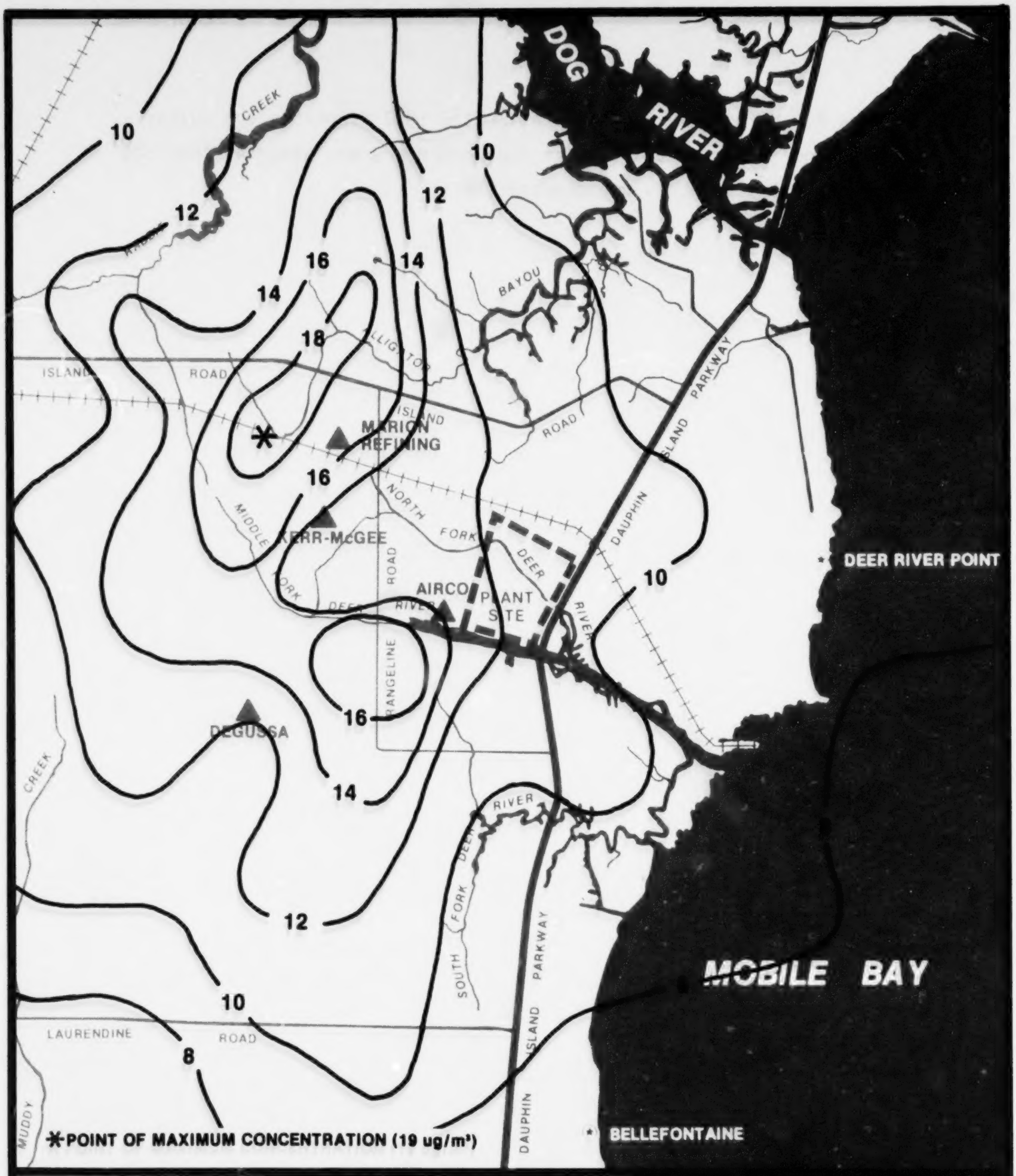
Natural gas is presently used by a large percentage of industries in Mobile; however, there is a shortage of gas and curtailment proceedings are underway. Burning natural gas produces only nitrogen oxides in significant quantities. If gas supplies become curtailed, industries could be forced into burning fuel oil, which would greatly increase sulfur dioxide emissions in Mobile. However, it is beyond the scope of this study to investigate the effects such emissions might have on Mobile air quality. For present purposes, it will be assumed that industries will continue to use natural gas through the year 1992.

The following additional assumptions, which affect estimations of sulfur dioxide and particulate matter emission levels, were used to project the 1992 baseline conditions:

1. Industrial source emissions of sulfur dioxide and particulate matter will increase directly with economic growth in Mobile County.
2. Atmospheric emissions from electric utility power generating stations will increase in proportion to economic projections for the industry in Mobile County.
3. Area source emissions of particulate matter will vary proportionally to population increases within various areas of Mobile County.

Industrial growth projections developed by the Bureau of Economic Research and SARPC population projections were utilized in developing the projections of emissions.

Figures B.A.8 and B.A.9 show the projected 1992 isopleths for sulfur dioxide and TSP concentrations in the Theodore area, assuming that the proposed cement plant is not constructed.


DOG RIVER
10
CREEK
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12
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16
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14
BAYOU
18
ALLIGATOR
ISLAND ROAD
ISLAND ROAD
MARION REFINING
16
NORTH FORK
KERR-McGEE
MIDDLE FORK
DEER RIVER
AIRCO
PLANT SITE
DEER RIVER
DAUPHIN ISLAND PARKWAY
10
DEER RIVER POINT
RANGELINE ROAD
16
DEGUSSA
CREEK
14
RIVER
DEER
SOUTH FORK
12
MOBILE BAY
10
LAURENDINE ROAD
8
MUDDY
DAUPHIN ISLAND PARKWAY
BELLEFONTAINE
*POINT OF MAXIMUM CONCENTRATION (19 ug/m³)

Figure B.A.8

ISOPLETHS OF PROJECTED ANNUAL AVERAGE GROUND-LEVEL SULFUR DIOXIDE CONCENTRATIONS (ug/m³), THEODORE, ALABAMA, 1992

0 0.5 1
SCALE IN KILOMETERS

N

SOURCE: Environmental Science and Engineering, Inc., 1977.

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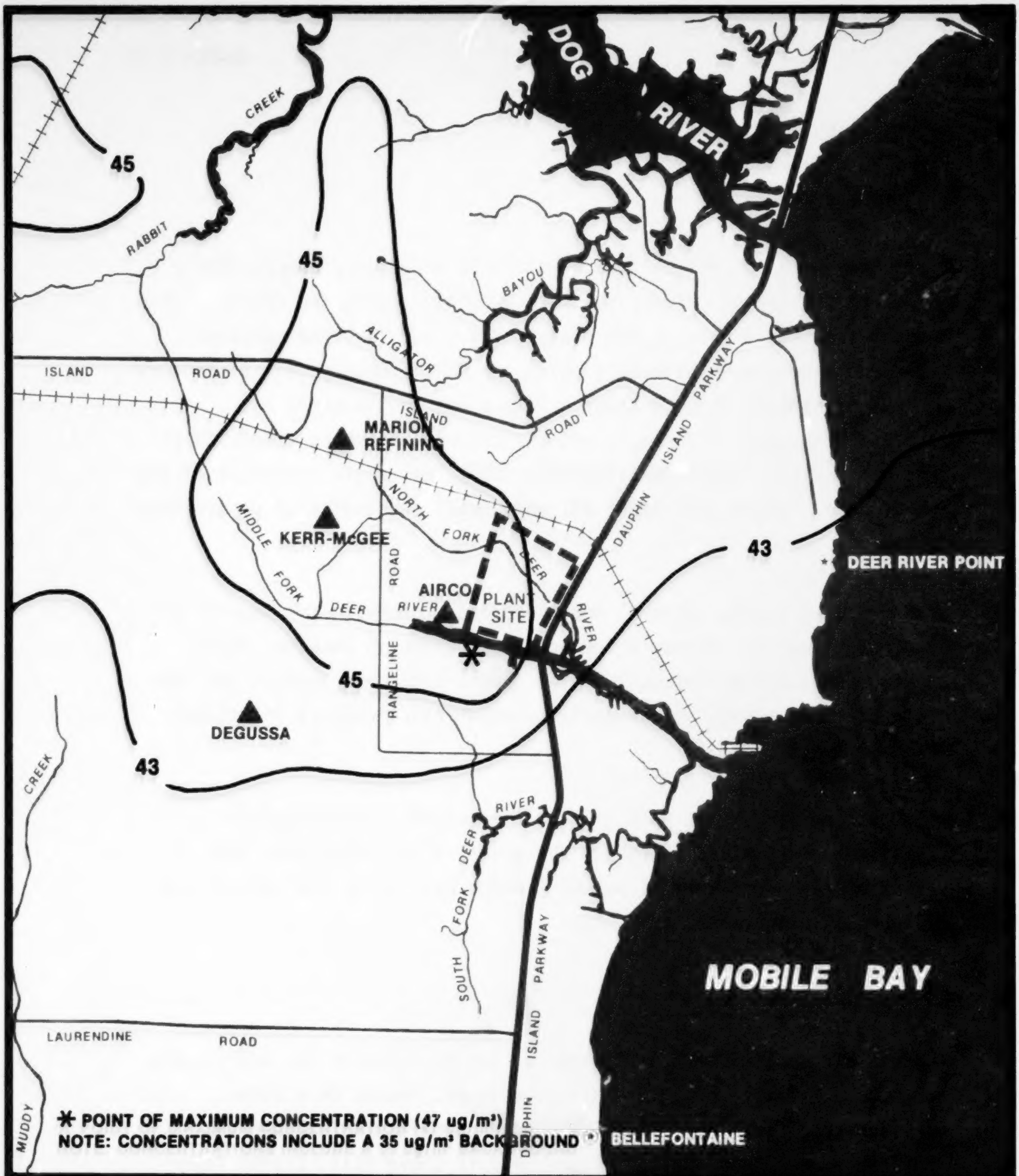
PROPOSED CEMENT MANUFACTURING
PLANT THEODORE INDUSTRIAL PARK
MOBILE, ALABAMA


DOG RIVER
RABBIT CREEK
45
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BAYOU
ALLIGATOR
ISLAND ROAD
ISLAND ROAD
MARION REFINING
KERR-McGEE
MIDDLE FORK DEER RIVER
NORTH FORK DEER RIVER
RANGELINE ROAD
AIRCO
PLANT SITE
DAUPHIN ISLAND PARKWAY
43
DEER RIVER POINT
45
DEGUSSA
43
CREEK
SOUTH FORK DEER RIVER
MOBILE BAY
LAURENDINE ROAD
MUDDY
BELLEFONTAINE

✱ POINT OF MAXIMUM CONCENTRATION (47 ug/m³)
NOTE: CONCENTRATIONS INCLUDE A 35 ug/m³ BACKGROUND

Figure B.A.9
ISOPLETHS OF PROJECTED ANNUAL AVERAGE GROUND-LEVEL SUSPENDED PARTICULATE MATTER CONCENTRATIONS (ug/m³), THEODORE, ALABAMA, 1992

0 0.5 1
SCALE IN KILOMETERS

SOURCE: Environmental Science and Engineering, Inc., 1977.

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QUARRY SITE

EXISTING ENVIRONMENT (1977)

Emission Sources

The quarry site is located in a remote area of western Monroe County, bordering the Alabama River and Clarke County. These two counties have a small industrial base at the present time, but they are currently experiencing rapid industrial growth. In Monroe County, the stationary sources of air pollution include a lime plant in Claiborne and a boxboard plant, asphalt plant, and two concrete batching plants in or near Monroeville, about 25 kilometers (15 miles) east- northeast of the quarry site. These operations all emit small quantities of particulate matter.

Within Clarke County, several small sources of both sulfur dioxide and particulate matter include a lumbering operation in Jackson, about 25 kilometers (15 miles) west of the quarry site, and asphalt and concrete batching plants in Thomasville, about 65 kilometers (40 miles) west-northwest.

Construction of a kraft pulp mill is now underway approximately 12 kilometers (7 miles) north of the quarry site. When this mill begins operation, levels of sulfur dioxide and TSP at the quarry site will probably increase.

Measured Air Quality

Ambient air quality data available for the vicinity of the quarry site are sparse, largely because monitoring is not needed in a rural, non-industrialized area. The State of Alabama has maintained and operated ambient TSP monitors since 1972 in Grove Hill, Clarke County, about 32 kilometers (20 miles) northwest of the quarry site, and in Evergreen, Conecuh County, about 56 kilometers (35 miles) east of the quarry site. TSP levels at both locations have remained fairly constant, reflecting little growth in these areas (see Table B.A.4 and Figure B.A.10). The levels are typical for rural areas and are well

Table B.A.4. Summary of Ambient Total Suspended Particulate Matter Data (ug/m^3) in the Vicinity of the Proposed Quarry Site, 1972 to 1977

	Year					
Station	1972	1973	1974	1975	1976	1977
Grove Hill, Clarke County						
Geometric Mean	38	39	38	31	32	44
24-Hour Maximum	69	114	86	50	87	NA
Evergreen, Conecuh County						
Geometric Mean	28	31	28	25	32	35
24-Hour Maximum	67	114	60	50	63	NA

Source: Alabama Air Pollution Control Commission, 1976 and 1977.

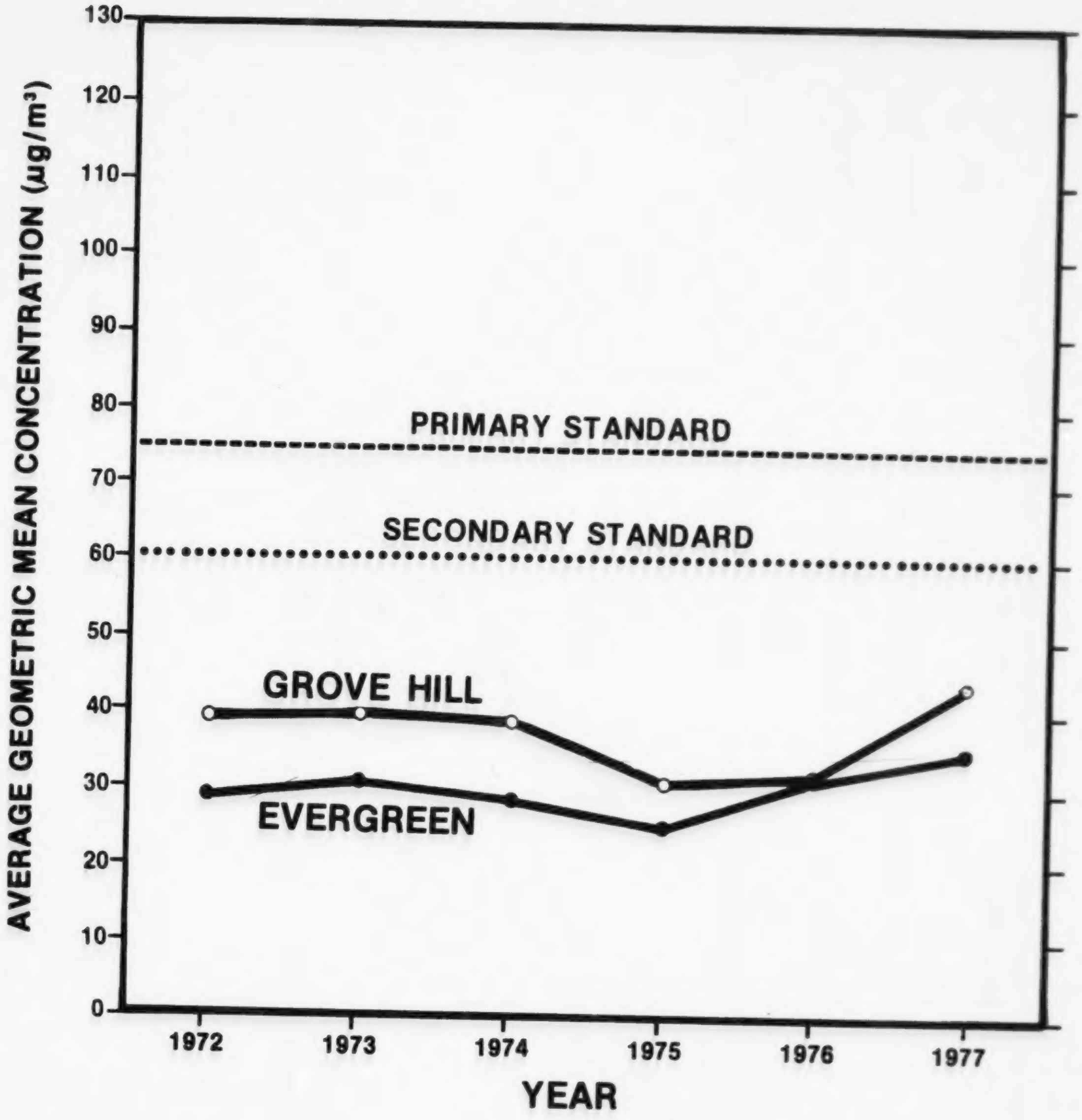

Figure B.A.10
TRENDS IN AMBIENT TOTAL SUSPENDED PARTICULATE MATTER CONCENTRATIONS, RURAL ALABAMA IN THE REGION OF THE PROPOSED IDEAL QUARRY SITE, 1972-1977

SOURCE. Alabama Air Pollution Control Commission, 1978.

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PROPOSED GAILLARD QUARRY
MONROE COUNTY, ALABAMA

below the Secondary AAQS. Because the monitors are in population centers, TSP levels at the proposed quarry site are expected to be somewhat lower.

Estimated Air Quality

Existing levels of pollutants at the site are expected to be at or near background levels. Background levels of pollutants are a function of geographical location, meteorology, and topography, but are generally considered to fall within the following ranges (McCormick and Holzworth, 1976; Robinson and Robbins, 1968):

Sulfur dioxide--2 to 25 ug/m^3
Suspended particulate matter--20 to 30 ug/m^3
Nitrogen oxides--2 to 25 ug/m^3
Total hydrocarbons--<650 ug/m^3
Non-methane hydrocarbons--<1 ug/m^3
Carbon monoxide--<1 mg/m^3

PROJECTED 1992 ENVIRONMENT

If no industrial sources locate near the quarry site, the levels of atmospheric pollution would remain at essentially background levels. However, a large paper mill currently under construction approximately 11 kilometers (7 miles) north of the quarry site will affect air quality at the quarry site.

Analysis of the air quality aspects of the mill's emissions (Associated Water and Air Resources Engineers, Inc., 1975), showed that maximum concentration levels within 2 kilometers (1 mile) of the proposed mill would be:

Sulfur Dioxide:	Annual Average:	1 ug/m^3
	24-Hour:	8 ug/m^3
	3-Hour:	71 ug/m^3
Suspended Particulate Matter:		
	Annual Average:	4 ug/m^3
	24-Hour:	33 ug/m^3

Since the quarry site is 11 kilometers (7 miles) from the mill, sulfur dioxide and TSP levels at the quarry site will be much less than those listed above, and 1992 levels should be only slightly elevated over existing baseline levels.

APPENDIX B. BASELINE
NOISE LEVELS

INTRODUCTION

The term "noise", as used in this document, is defined as perceivable sound levels, and is rated relative to levels suggested in the EPA Report 550/9-74-004, "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety" (U.S. EPA, Office of Noise Abatement and Control, 1974). The sound levels do not generally correspond to instantaneous levels, but are equivalent or energy-average sound levels.

SOUND MEASUREMENT

A system of sound measurement based upon the response of the human ear has been developed. The quantity measured is the sound level (L) and the units are decibels (dB). The sound level follows a power law such that a 10 dB increase is perceived as a doubling of loudness. The addition of two equal but random noise sources results in a 3 dB increase in the total sound level. Figure B.N.1 presents various sources and their sound levels on the A scale, which most nearly approximates the response of the human ear. Sound level decreases as a result of obstructions such as trees and natural buffer zones that attenuate the pressure waves. Sound levels may, however, be increased by obstructions that tend to reflect sound pressure.

Environmental noise can be measured with a sound level meter and expressed in terms of its frequency distribution, or by a scale which electronically attenuates certain frequencies to match the characteristics of the human ear (A-scale) or some other receptor. Most guidelines for environmental noise are defined in terms of the A-scale and are expressed as one of the following statistical measures (U.S. Federal Highway Administration, 1973; U.S. EPA, Office of Noise Abatement and Control, 1974):

AT A GIVEN DISTANCE FROM NOISE SOURCE	DECIBELS RE 20 $\mu N/m^2$	ENVIRONMENTAL
	140	
50 HP SIREN (100')		
	130	
JET TAKEOFF (200')	120	
RIVETING MACHINE	110	CASTING SHAKEOUT AREA
CUT OFF SAW PNEUMATIC PEEN HAMMER	100	ELECTRIC FURNACE AREA
TEXTILE WEAVING PLANT SUBWAY TRAIN (20')	90	BOILER ROOM PRINTING PRESS PLANT
PNEUMATIC DRILL(50')	80	TABULATING ROOM INSIDE SPORT CAR (50 MPH)
FREIGHT TRAIN (100') VACUUM CLEANER (10') SPEECH (1')	70	
	60	NEAR FREEWAY (AUTO TRAFFIC) LARGE STORE ACCOUNTING OFFICE
LARGE TRANSFORMER 200	50	PRIVATE BUSINESS OFFICE LIGHT TRAFFIC (100) AVERAGE RESIDENCE
	40	MIN LEVELS — RESIDENTIAL AREAS IN CHICAGO AT NIGHT
SOFT WHISPER	30	STUDIO (SPEECH)
	20	STUDIO FOR SOUND PICTURES
	10	
THRESHOLD OF HEARING YOUTHS 1000-4000 Hz	0	

Figure B.N.1
TYPICAL A-WEIGHTED SOUND LEVELS

SOURCE. Peterson and Gross, 1974.

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1. L_{10} - the sound level which is exceeded 10 percent of the time during a measurement period.
2. L_{50} - the sound level which is exceeded 50 percent of the time during a measurement period.
3. $L_{eq}(t)$ - the sound level equal in cumulative energy to all time-varying noise produced during a specific time period.
4. $L_{eq}(24)$ - the sound level equal in cumulative energy to all time-varying noise produced during a 24-hour period.
5. $L_{(dn)}$ - the equivalent sound level for day and night (10:00 pm to 7:00 am) in which the equivalent 24-hour level has been weighted for nighttime exposure by the addition of ten decibels. This level can be used to relate noise in residential environments to speech, sleep, and activity interference.

HEALTH AND WELFARE EFFECTS

High levels of noise have been shown (U.S. EPA, Office of Noise Abatement and Control, 1974) to cause the following three types of effects on people and their activities:

1. Effects on hearing;
2. Effects on general mental state as evidenced by annoyance; and
3. Interference with specific activities such as speech or sleep.

Some sound levels are believed to cause stress and its related disorders. It was previously assumed that protection against hearing loss provided sufficient protection against stress-related disorders. It is now known that levels below those believed to affect hearing are sufficient to produce physiological symptoms related to stress (U.S. EPA, Office of Noise Abatement and Control, 1974).

GUIDELINES

Highway traffic has long been recognized as a major contributor to environmental noise. The U.S. Department of Transportation has published Design Noise Level criteria based upon land use (U.S. Federal Highway

Administration, 1973). The suggested criteria are L_{10}'s for various land use categories and are reproduced in Table B.N.1.

The U.S. EPA has published noise level limitations requisite to protect the public against hearing loss or activity interference for various land use categories (U.S. EPA, Office of Noise Abatement and Control, 1974). Sound levels which are given as $L_{eq}(24)$ and $L_{eq}(dn)$, are averages on an energy basis (see Table B.N.2). These values are for long-term exposures and take into consideration the cumulative effects of noise. Noise level limitations chosen to protect the public against hearing loss have been set such that 96 percent of the population will not experience a hearing threshold shift of more than 5 dBA at 4000 Hertz (cycles per second) in 40 years of continual exposure. These levels are not intended to be used as standards, nor should they be thought of as discrete numbers, as they are described in terms of energy equivalents.

Table B.N.1. Federal Highway Administration Design Noise Level/Land Use Relationships

Land Use Category	Design Noise Level - L_{10}*	Description of Land Use Category
A	60 dBA (Exterior)	Tracts of lands in which serenity and quiet are of extraordinary significance and serve an important public need, and where the preservation of those qualities is essential if the area is to serve its intended purpose. Such areas could include amphitheaters, particular parks or portions of parks, or open spaces which are dedicated or recognized by appropriate local officials for activities requiring special qualities of serenity and quiet.
B	70 dBA (Exterior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, picnic areas, recreation areas, playgrounds, active sports areas, and parks.
C	75 dBA (Exterior)	Developed lands, properties, or activities not included in categories A and B above.
D	Variable	For requirements on undeveloped lands, see paragraphs 5a(5) and (6), Federal Highway Administration policy and procedure manual.
E	55 dBA	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

* L_{10} represents the level which can be exceeded not more than 10 percent of the time.

Source: U.S. Federal Highway Administration, 1973.

Table B.N.2. Yearly Average* Equivalent Sound Levels Identified as Requisite to Protect the Public Health and Welfare with an Adequate Margin of Safety

Land Use	Measure	Indoor			Outdoor		
		Activity Inter-ference	Hearing Loss Considera-tion	To Protect Against Both Effects (b)	Activity Inter-ference	Hearing Loss Considera-tion	To Protect Against Both Effects (b)
1 Residential with outdoor space and farm residences	L_{dn}	45		45	55		55
	$L_{eq}(24)$		70			70	
2 Residential with no outside space	L_{dn}	45		45			
	$L_{eq}(24)$		70				
3 Commercial	$L_{eq}(24)$	(a)	70	70(c)	(a)	70	70(c)
4 Inside Transportation	$L_{eq}(24)$	(a)	70	(a)			
5 Industrial	$L_{eq}(24)$(d)	(a)	70	70(c)	(a)	70	70(c)
6 Hospitals	L_{dn}	45		45	55		55
	$L_{eq}(24)$		70			70	
7 Educational	$L_{eq}(24)$	45		45	55		55
	$L_{eq}(24)$(d)		70			70	
8 Recreational Areas	$L_{eq}(24)$	(a)	70	70(c)	(a)	70	70(c)

Table B.N.2. Yearly Average* Equivalent Sound Levels Identified as Requisite to Protect the Public Health and Welfare with an Adequate Margin of Safety (Continued, page 2 of 2)

		Indoor			Outdoor		
Land Use	Measure	Activity Interference	Hearing Loss Consideration	To Protect Against Both Effects (b)	Activity Interference	Hearing Loss Consideration	To Protect Against Both Effects (b)
9 Farm Land and General Unpopulated Land 70(c)	$L_{eq}(24)$				(a)	70	

Code:
a. Since different types of activities appear to be associated with different levels, identification of a maximum level for activity interference may be difficult except in those circumstances where speech communication is a critical activity.
b. Based on lowest level.
c. Based only on hearing loss.
d. An $L_{eq}(8)$ of 75 dB may be identified in these situations as long as the exposure over the remaining 16 hours per day is low enough to result in a negligible contribution to the 24-hour average, i.e., no greater than an L_{eq} of 60 dB.

Note: Explanation of identified level for hearing loss: the exposure period which results in hearing loss at the identified level is a period of 40 years.

*Refers to energy rather than arithmetic averages.

Source: U.S. EPA, Office of Noise Abatement and Control, 1974.

PLANT SITE

EXISTING ENVIRONMENT (1977)

Study Area Description

The study area, which lies within south Mobile County is a sparsely populated and relatively undeveloped environment. The major sources of noise are small industries, a few large plants, and highways.

A full characterization of local land use is included in the socioeconomic section of this study. The land use in the area is shown in Figure B.N.2.

The area near the plant site is characterized mainly as industrial, residential, or vacant. In the immediate vicinity of the plant, there are small residential areas to the north, east, and south. Within 1.7 kilometers (1 mile) of the proposed site, there are 115 dwellings and an estimated 361 residents. Some other land uses include nurseries and small amounts of commercial, institutional, and agricultural properties.

Traffic is one of the major noise sources in the vicinity of the plant site. Levels of traffic flows are presented in Figure B.N.3. for the road segments closest to the proposed site. Rangeline Road is a north-south detour from Dauphin Island Parkway via Island Road (also known as Hamilton Blvd.). Thus traffic is fairly light on the Parkway immediately north and south of the barge canal.

Barge and ship traffic along the Theodore Barge Canal is extremely light. Approximately two round trips per week are made in association with the ferroalloy plant (Airco, Inc.).

Industrial noise sources consist of four relatively large plants which are shown in Figure B.N.4.

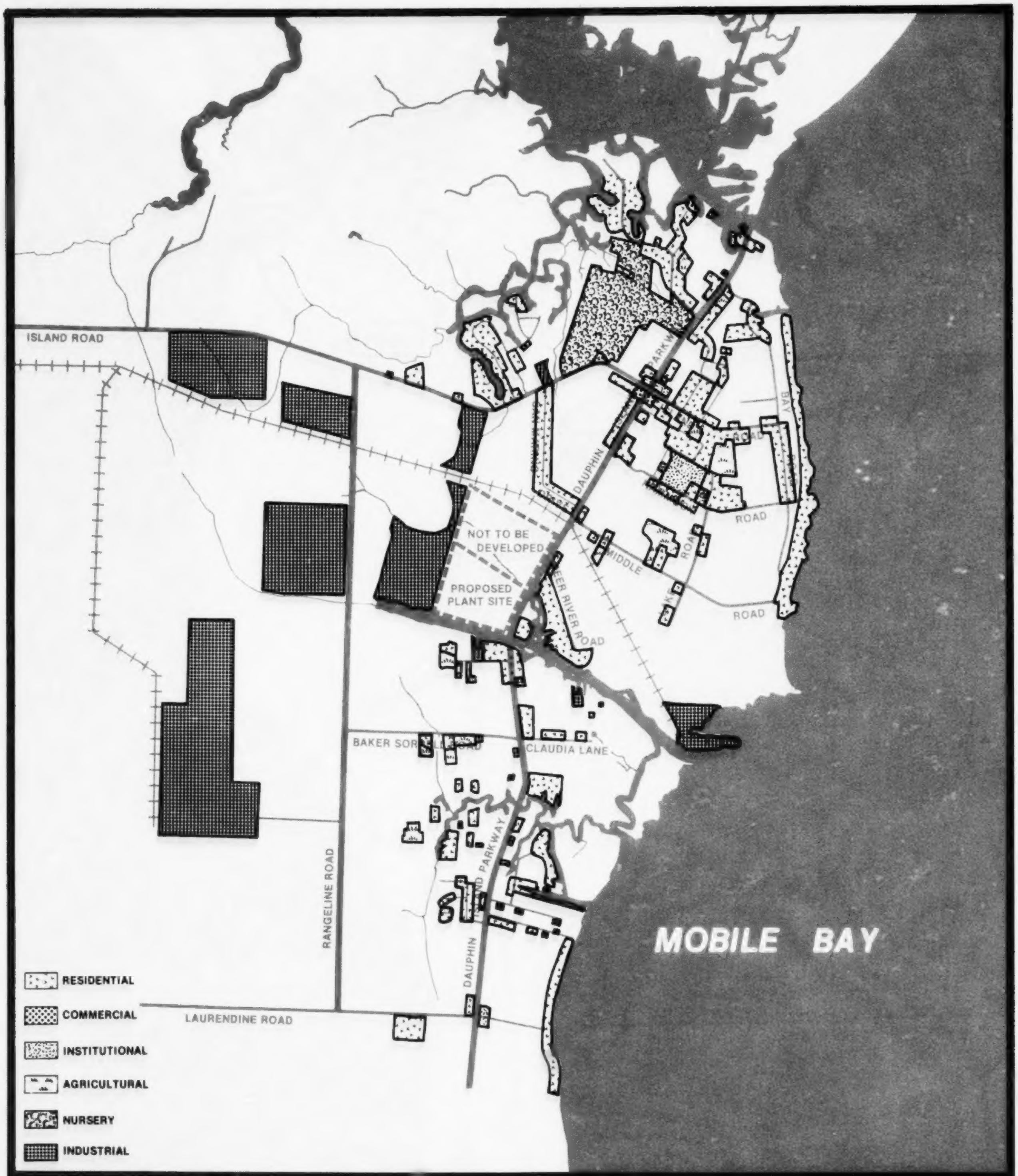
ISLAND ROAD
RANGELINE ROAD
LAURENDINE ROAD
BAKER SOR ROAD
CLAUDIA LANE
DAUPHIN PARKWAY
DAUPHIN
PARKWAY
DEER RIVER ROAD
MIDDLE ROAD
ROAD
ROAD
ROAD
NOT TO BE DEVELOPED
PROPOSED PLANT SITE
MOBILE BAY
RESIDENTIAL
COMMERCIAL
INSTITUTIONAL
AGRICULTURAL
NURSERY
INDUSTRIAL
0 0.5 1
SCALE IN KILOMETERS
N

Figure B.N.2
PRESENT LAND USE IN THE VICINITY OF THE PROPOSED CEMENT PLANT

SOURCE: Environmental Science and Engineering, Inc., 1977.

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PROPOSED CEMENT MANUFACTURING
PLANT THEODORE INDUSTRIAL PARK
MOBILE, ALABAMA

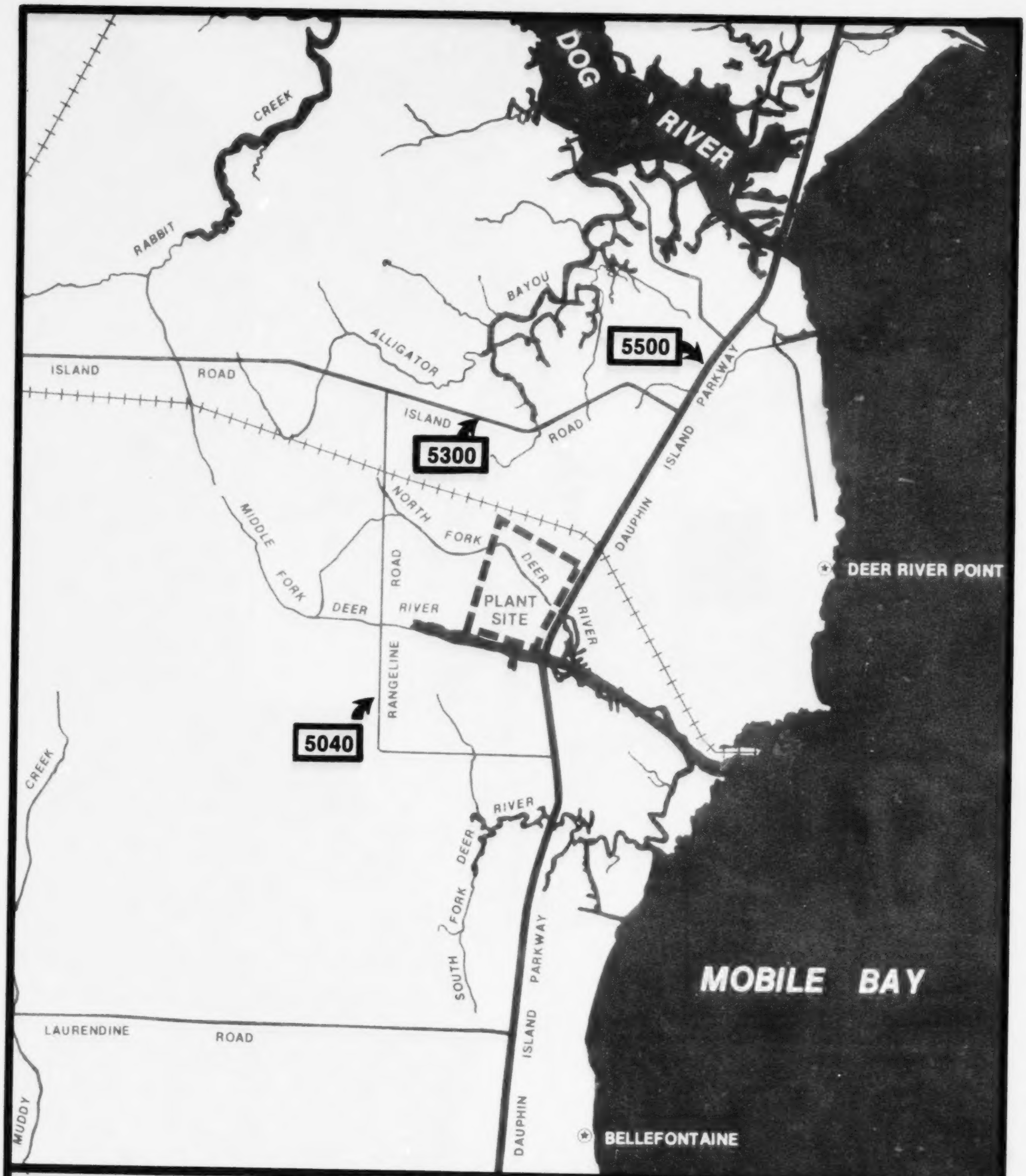
DOG RIVER
RABBIT CREEK
BAYOU ALLIGATOR
ISLAND ROAD
ISLAND ROAD
5500
5300
5040
DAUPHIN ISLAND PARKWAY
NORTH FORK
MIDDLE FORK
DEER RIVER
RANGELINE ROAD
PLANT SITE
DEER RIVER
DEER RIVER POINT
CREEK
SOUTH FORK DEER RIVER
MOBILE BAY
LAURENDINE ROAD
MUDDY
DAUPHIN ISLAND PARKWAY
BELLEFONTAINE

Figure B.N.3
TRAFFIC VOLUMES
(1977 AVERAGE DAILY TRAFFIC IN VEHICLES PER DAY)

0 0.5 1
SCALE IN KILOMETERS

N

SOURCE: Environmental Science and Engineering, Inc., 1977.

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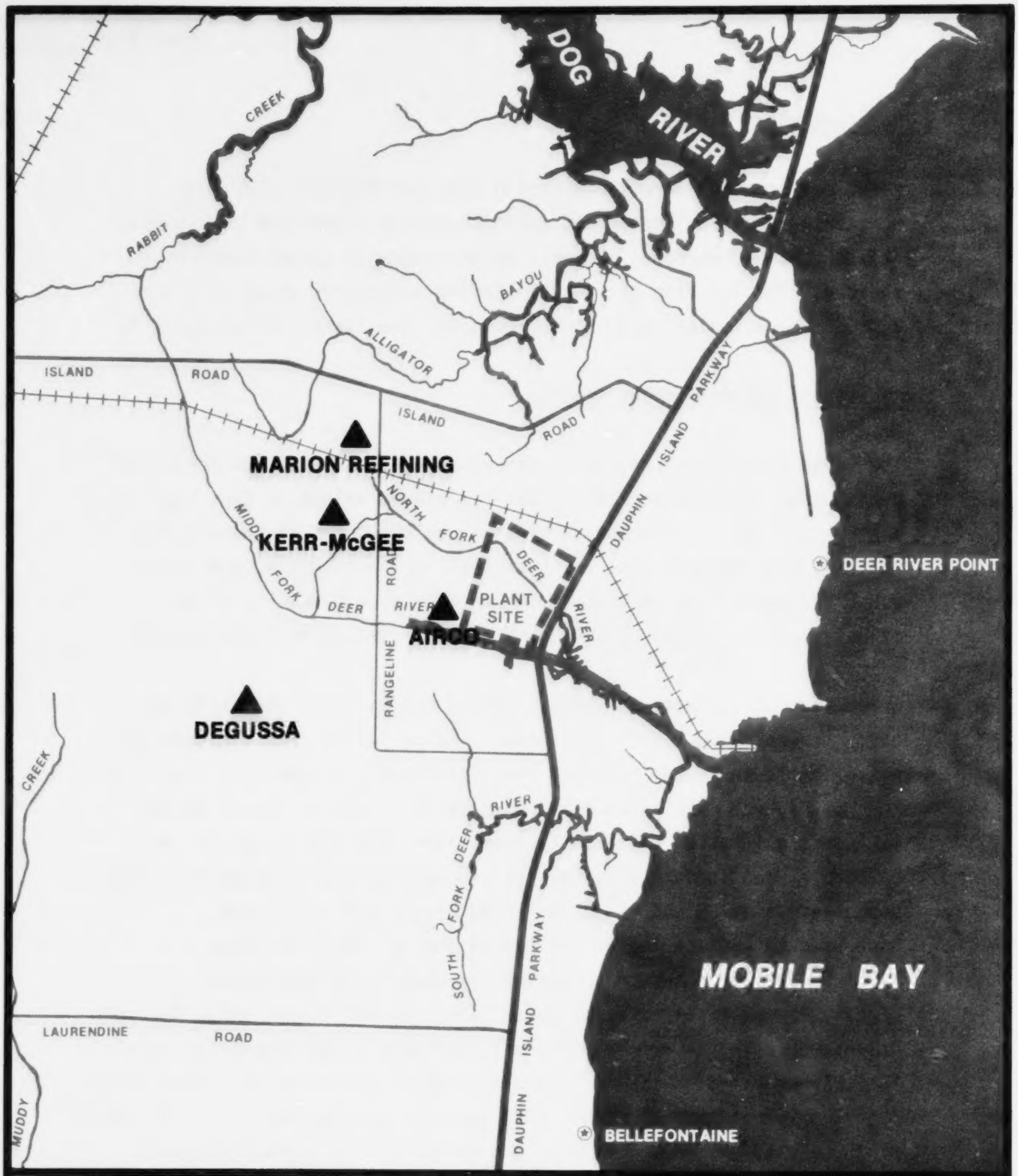
DOG RIVER
CREEK
RABBIT
BAYOU
ALLIGATOR
ISLAND ROAD
ISLAND ROAD
DAUPHIN ISLAND PARKWAY
MARION REFINING
KERR-McGEE
MIDDLE FORK DEER RIVER
NORTH FORK DEER RIVER
RANGELINE ROAD
PLANT SITE
AIRCO
DEER RIVER POINT
DEGUSSA
CREEK
SOUTH FORK DEER RIVER
MOBILE BAY
LAURENDINE ROAD
MUDDY
BELLEFONTAINE
0 0.5 1
SCALE IN KILOMETERS
N

Figure B.N.4
INDUSTRIAL NOISE SOURCES IN THE VICINITY OF THE PROPOSED CEMENT PLANT

SOURCE: Environmental Science and Engineering, Inc., 1977.

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Baseline Noise Survey

Noise measurements were taken during June and October, 1977, at monitoring stations located at noise-sensitive sites such as schools, residences, and churches, as well as at strategic points near noise sources. The location of each monitoring station is shown in Figure B.N.5. Characteristics of these locations are listed in Table B.N.3.

Results of the Monitoring Program

The noise monitoring program at the proposed plant site was conducted during June and October, 1977. The calculated values of L_{10}, L_{50} and L_{eq} for each monitoring station at various times in the vicinity of the proposed plant site are presented in Tables B.N.4, B.N.5 and B.N.6, respectively. Sufficient measurements were made to allow calculation of L_{dn} and $L_{eq}(24)$, which are presented in Table B.N.7.

Comparison of the data in Tables B.N.4 and B.N.7 with the noise standards presented in Tables B.N.1 and B.N.2 indicates that the existing noise levels in the vicinity of the plant site are generally low. The Federal Highway Administration Design Noise Levels (L_{10}) are 70 dBA for most residential and institutional land uses and 75 dBA for most commercial and industrial land. EPA recommends yearly outdoor average sound levels of 55 dBA (L_{dn}) and 70 dBA (L_{24}) for these same land uses to protect the public health and welfare. As shown in Table B.N.4, the observed values of L_{10} were below the Federal Highway Administration Design Noise Levels in all cases, since the only values above 70 dBA were observed at Station 4 in an industrial area. The EPA-suggested levels which are listed for each station alongside the observed values in Table B.N.7 were exceeded at Stations 6 and 12. Both of these stations were located along roads with relatively heavy traffic.

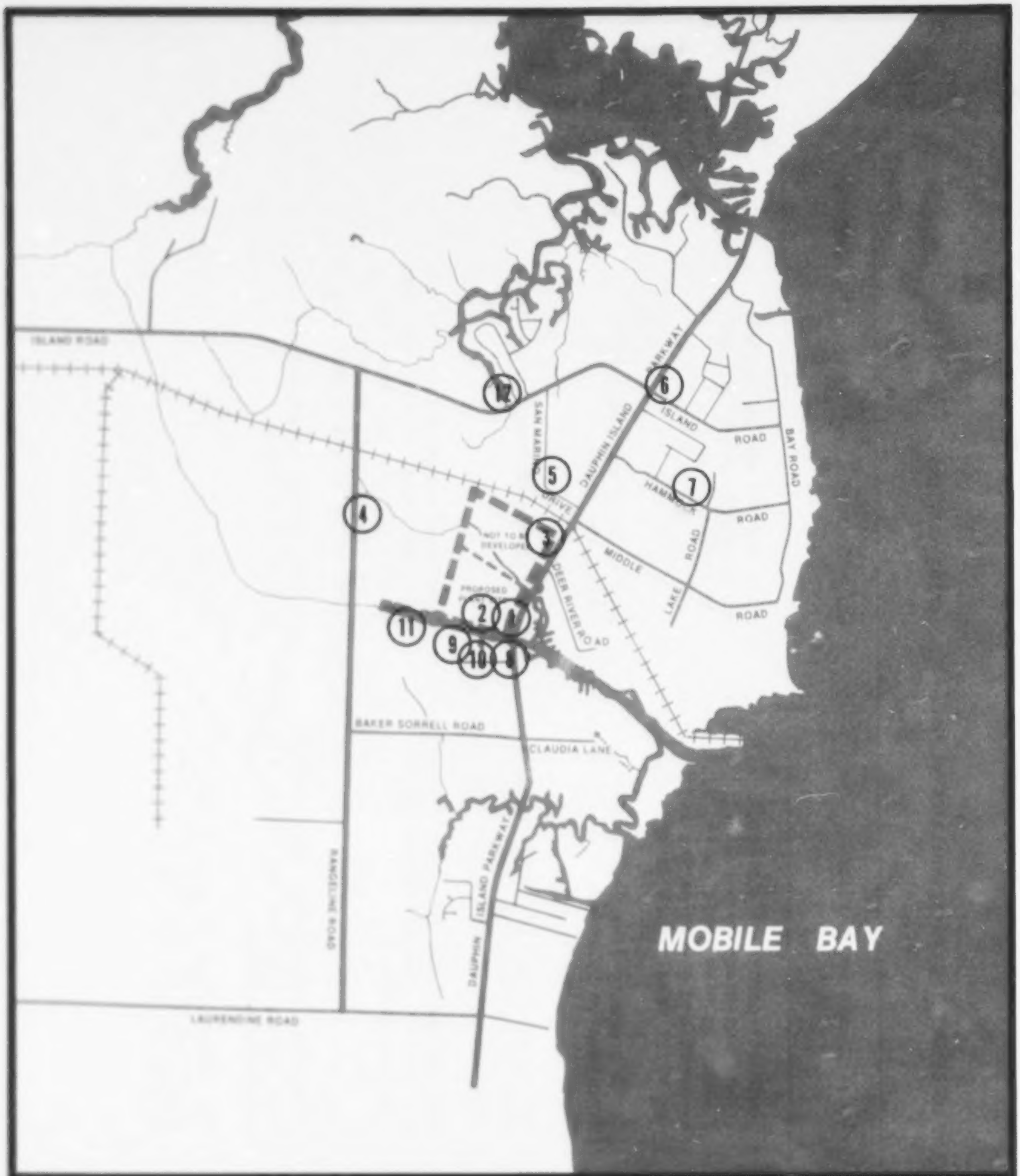
ISLAND ROAD
12
6
SAN MARIN
DAUPHIN ISLAND PARKWAY
ISLAND ROAD
BAY ROAD
5
7
HAMMOCK ROAD
DRIVE
4
3
NOT TO BE DEVELOPED
MIDDLE ROAD
LAKE ROAD
DEER RIVER ROAD
PROPOSED
2
1
11
9
10
8
BAKER SORRELL ROAD
CLAUDIA LANE
RANGELINE ROAD
DAUPHIN ISLAND PARKWAY
LAURENDINE ROAD
MOBILE BAY

Figure B.N.5
NOISE MONITORING STATIONS

0 0.5 1
SCALE IN KILOMETERS

N

SOURCE: Environmental Science and Engineering, Inc., 1977.

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Table B.N.3. Locations and Characteristics of Noise Monitoring Stations

Station No.	Location and Description	Noise Sources	Land Use*
1	Southeast corner of the Ideal Basic Industries property and along the road. Bounded by pine trees on the east and by trees and shrubs on the west. Existing water canal south of the station.	Minor traffic on the roadway and in canal and by distant industries.	9
2	South property line facing the canal. Area covered by shrubs and uneven terrain.	Boat traffic and industry across the canal.	9
3	Northeast corner of Ideal property. Many tall pine trees present in the area; few residences across the street.	Traffic and distant industries.	9
4	West of the Ideal property and just east of the road between Airco and and Kerr McGee.	Kerr McGee plant and traffic along the road. (There was some construction in the area, but noise measurements were not taken while it was occurring.)	9
5	Within the residential area north of Ideal plant site and the Louisville and Nashville Railroad.	Traffic to the subdivision. Distant industries.	1
6	The intersection of Island Road (Hamilton Blvd.) and Dauphin Island Parkway at Hollingers Island Churchyard.	Traffic.	3

Table B.N.3. Locations and Characteristics of Noise Monitoring Stations (Continued, page 2 of 2)

Station No.	Location and Description	Noise Sources	Land Use*
7	Hammock Road at elementary school parking lot. Garden nursery across the road.	Traffic and machinery associated with nursery.	7
8	Along the barge canal south bank. Brush and trees in surrounding area; a few residences in the vicinity.	Canal traffic and distant industries.	1
9	Residential area nearest to alloy plant. Located south of the barge canal.	Alloy plant across canal.	1
10	Residential area south of the barge canal and adjacent to drydock.	Drydock and alloy plant.	1
11	Concrete batch plant south of barge canal and directly across from from alloy plant.	Alloy plant across canal.	5
12	Off of Island Road (Hamilton Blvd.)	Traffic.	2

* For explanation of land use numbers, refer to Table B.N.2.

Source: Environmental Science and Engineering, Inc., 1977.

Table B.N.4. L_{10} Noise Levels (dBA) Measured in the Baseline Study

	Test Number											
	Daytime Measurements									Nighttime Measurements		
Station	1	2	3	4	5	6	7	8	9	1	2	3
1	51	45	49	49	47	55	49	47	51	43	51	
2	47	61	57	41						51		
3	51	45	45	45	49	47	47	49		41		
4	69	73	67	71	71	69				69		
5	49	51	49	47	49	49	55	47		43		
6	67	63	65	69	63	63				55		
7	51	55	51	61	55	49				45		
8	55	43	55	51	47	45	49	49		51		
9	49	55	55									
10	53	59	55							47		
11	55	63	65							65		
12	69	75	61							67		

Source: Environmental Science and Engineering, Inc., 1977.

Table B.N.5. L_{50} Noise Levels (dBA) Measured in the Baseline Study

	Test Number												
	Daytime Measurements									Nighttime Measurements			
Station	1	2	3	4	5	6	7	8	9	1	2	3	4
1	47	43	45	45	45	51	45	39	49	43	51		
2	45	51	53	39						45			
3	47	45	39	41	47	43	43	39		41			
4	63	59	57	65	65	65				65			
5	45	47	45	43	45	45	45	43		39			
6	59	55	59	61	57	51				45			
7	47	53	43	45	41	47				45			
8	51	43	53	49	45	43	45	45		49			
9	47	51	53										
10	49	53	53							45			
11	51	59	61							57			
12	53	55	55							51			

Source: Environmental Science and Engineering, Inc., 1977.

Table B.N.6. L_{eq} Noise Levels (dBA) Measured in the Baseline Study

Station	Test Number											
	Daytime Measurements									Nighttime Measurements		
	1	2	3	4	5	6	7	8	9	1	2	3
1	48	44	46	46	45	54	47	41	49	43	51	
2	45	54	54	39						48		
3	48	45	41	43	47	45	44	44		41		
4	66	63	61	68	67	66				66		
5	46	48	46	44	45	46	46	44		40		
6	64	60	62	64	60	56				49		
7	49	53	47	53	46	48				45		
8	51	43	53	49	45	43	46	46		49		
9	47	52	54									
10	50	55	53							45		
11	52	60	62							61		
12	60	69	69							5		

Source: Environmental Science and Engineering, Inc., 1977.

Table B.N.7. L_{dn} and $L_{eq}(24)$ Noise Levels (dBA) Measured in the Baseline Study

Station	L_{dn}*	$L_{eq}(24)$*
1	55	48/70
2	54	49/70
3	48	45/70
4	72	66/70
5	48/55	45
6	65	61/55
7	55	53/55
8	55/55	48
9	53/55	51
10	54/55	52
11	67	59/70
12	67/55	66

* The second numbers in the columns refer to the sound levels requisite to protect public health and welfare according to the land use. See Table B.N.2.

Source: Environmental Science and Engineering, Inc., 1977.

Aside from the traffic, most noise appeared to come from the drydocks in the channel, the ferroalloy plant, and the chemical plant in the area.

Stations 8, 9, and 10 were equal to or relatively close to the suggested sound levels (L_{dn}) of 55 dBA. Precisely how much of the noise can be apportioned to the ferroalloy plant and how much to the drydocks is unclear since both plants operated intermittently and irregularly. It was noted that the ferroalloy plant was operating at a reduced process load in anticipation of a temporary shut-down.

PROJECTED 1992 ENVIRONMENT

Introduction

Noise levels in the vicinity of the Ideal Basic Industries property are expected to increase in the future due to new industrial development, construction of the Theodore Ship Channel and Barge Canal Extension, increased waterway usage, and increased highway traffic. Future land use in this area, which relates to both noise generation and the seriousness of noise impacts, is described in the socioeconomic section of this appendix. The most important characteristics are the expected conversion of large amounts of land to industrial use by 1992, and the taking of land for construction of the ship channel. Both of these circumstances will reduce the amount of residential land (the land use most vulnerable to noise impacts) near the Ideal Basic Industries property.

Projection Methodology

The baseline noise forecasts for 1992 include the effects of:

1. Existing noise sources,
2. The greatly increased volume of waterway traffic, and
3. The expected increases in vehicular traffic on major highways.

It has not been possible to consider future industrial development since the types of facilities locating in the area by 1992 are currently unknown. The assumption has been made that changes in traffic flows on secondary roads will not contribute significantly to noise levels.

The noise effects of highway traffic have been estimated using a mathematical model developed by the Highway Research Board (Gordon, et al., 1971). Noise is derived as a function of traffic volume, vehicle speed, mix of vehicle types, and other factors. The forecasts of 1992 conditions have assumed the following average daily traffic volumes:

Dauphin Island Parkway north of Island Road	15,200
Island Road between Rangeline and the Parkway	18,000
Rangeline Expressway north of Island Road	25,300
Rangeline Road near Deer River	19,300

Noise effects due to waterway traffic on the ship channel have been estimated using research conducted by U.S.C., Incorporated, Consulting Engineers (1974) as part of the environmental impact assessment of the ship channel project. Relationships were established between the effects of tug/barge traffic on $L_{eq}(24)$, and the maximum noise levels produced at close range during short periods. The conceptual framework and baseline data developed in this study have been utilized to model the 1992 noise levels at the 12 stations considered in the present investigation. Along with the highway traffic volumes listed above, the forecasts have assumed that waterborne traffic on the ship channel will amount to 10 round trips of tug and tow per day. The resulting 1992 estimates are listed in Table B.N.8. (The locations of noise sampling stations are shown in Figure B.N.5.)

Discussion of Findings

The second number of each pair of numbers in Table B.N.8 refers to the sound level requisite to protect public health and welfare, according to EPA criteria. As noted earlier, these critical values are related to the land use at a given station. The two relevant land uses in the vicinity of the Ideal Basic Industries property are industrial land (critical level: 70 dBA) and residential land (critical level: 55 dBA).

In the absence of the proposed Ideal Basic Industries project, noise levels at most of the baseline monitoring stations will increase significantly between 1977 and 1992. The largest increases would occur at Stations 4, 8, 9, and 10. The very high noise levels at Station 4 are influenced by traffic on Rangeline Road. The 1992 noise levels are projected to exceed the EPA-recommended equivalent sound levels at only three stations. (The critical level is already exceeded in one of these

Table B.N.8. L_{dn} and $L_{eq}(24)$ Noise Levels (dBA) at Baseline Monitoring Stations in 1977 and in 1992*

Station	1977		1992	
	L_{dn}**	$L_{eq}(24)$**	L_{dn}**	$L_{eq}(24)$**
1	55	48/70	60	55/70
2	54	49/70	60	54/70
3	48	45/70	48	45/70
4	72	66/70	81	75/70
5	48/55	45	48/55	45
6	65	61/55	71	68/55
7	55	53/55	55	53/55
8	55/55	48	64	57/70
9	53/55	51	63	56/70
10	54/55	52	63	56/70
11	67	59/70	†	†
12	67/55	66	72/55	61

* Exclusive of any new industries

† No estimate since site is in future turning basin

** Second numbers in the columns refer to the sound levels requisite to protect public health and welfare according to land use. See Table B.N.2.

Source: Environmental Science and Engineering, Inc., 1977.

cases.) However, there are three other stations (Stations 8, 9 and 10) at which the levels would be exceeded except that the land is expected to convert from residential to industrial use between now and 1992. The overall impression created by the forecasts is that sound levels near the Ideal Basic Industries property would be greater in 1992 than in 1977, even in the absence of significant industrial development.

QUARRY SITE

EXISTING ENVIRONMENT (1977)

Baseline Survey

The proposed quarry site is an uninhabited tract of land located in a remote section of Monroe County that is progressively being converted from forest to improved pasture. The only sources of noise present are wildlife, other natural phenomena such as wind and water, and a single light-duty public road that traverses the extreme eastern section of the tract. Noise was monitored at three stations, located in the southern, central, and northeastern portions of the site (see Figure B.N.6 and Table B.N.9). The results of the survey are presented in Table B.N.10. At Stations 2 and 3, daytime values of L_{10}, L_{50}, and L_{eq} (10 minutes) were all between 35 dBA and 45 dBA, indicating very low noise levels. At Station 1, the measured values were substantially higher: L_{50} was 49 dBA, L_{10} was 51 dBA, and L_{eq} (10 minutes) was 52 dBA. However, the apparent explanation was that Station 1 was located adjacent to a stream and thus was affected by the sound of flowing water. It is unlikely that noise levels would increase substantially in the future without the proposed Ideal Basic Industries quarrying operation.

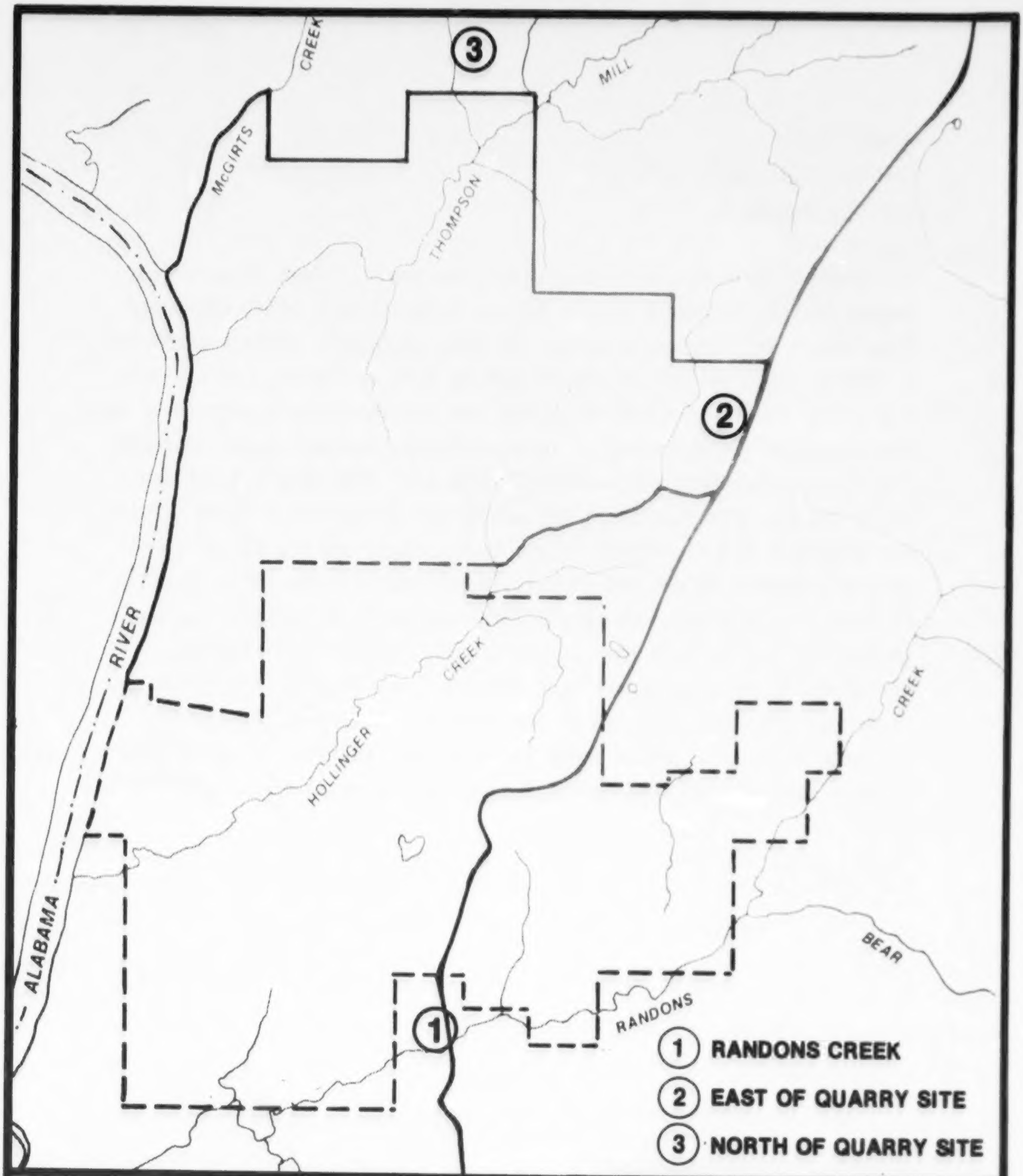
3
CREEK
MILL
McGIRTS
THOMPSON
2
RIVER
CREEK
HOLLINGER
CREEK
BEAR
ALABAMA
RANDONS
1
1 RANDONS CREEK
2 EAST OF QUARRY SITE
3 NORTH OF QUARRY SITE
0 0.5 1
SCALE IN KILOMETERS
N

Figure B.N.6
NOISE MONITORING STATIONS

SOURCE. Environmental Science and Engineering, Inc., 1977.

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Table B.N.9. Locations and Characteristics of Noise Monitoring Stations

Station No.	Location and Description	Noise Sources	Land Use*
1	Along Randons Creek on the north side of bridge. Area characterized by wildlife sounds, including water flow.	Wildlife sounds.	9
2	The center of the quarry site property.	Wildlife sounds.	9
3	The north end of the quarry site property and along Clay Road.	Wildlife sounds.	9

* For explanation of land use numbers, refer to Table B.N.2.

Source: Environmental Science and Engineering, Inc., 1977.

Table B.N.10. L_{10}, L_{50}, L_{eq} (10 minute) Noise Levels (dBA) Measured at the Quarry Site

Station	L_{10} Levels (Daytime)	L_{50} Levels (Daytime)	L_{eq} (10 minutes)
1	51	49	52
2	43	37	38
3	37	35	35

Source: Environmental Science and Engineering, Inc., 1977.

PROJECTED 1992 ENVIRONMENT

Present sound levels at the quarry site are affected only by wildlife, natural phenomena, and very light traffic on the Alabama River and Monroe County Road No. 1. No significant changes from present conditions are expected in the absence of the quarrying operation, except very localized increased noise levels due to livestock grazing and agricultural land management.

APPENDIX B. BASELINE

SOLID WASTE

INTRODUCTION

The applicable solid waste regulations concerning this project are described in Appendix A.

This section describes the existing disposal methods in Mobile and Monroe counties. In October of 1977, a field investigation of both counties was performed to survey present conditions and estimate 1980 availability for disposal of construction wastes (land clearing and building) and operating wastes (lunchroom, office, production, and maintenance).

PLANT SITE

In Mobile County, three main landfills which operate under the requirements of the state and local agencies are the Irvington, Kushla, and Mobile sites (see Figure B.S.W.1).

The closest site to the Theodore Industrial Park is the Irvington Landfill, which is owned by Mobile County and operated under contract to Mobile Waste Company. The active site is approximately 0.6 kilometer by 0.6 kilometer (3/8 mile by 3/8 mile) and utilizes a trench method of land disposal. A dragline digs a trench in the existing clay soil and the wastes are disposed on a 3 to 1 slope. These wastes are compacted and covered each day with a layer of clay. Each trench is about 15 meters wide and 23 meters long (50 feet by 75 feet) on its active or exposed face. The wastes accepted at the site are restricted to garbage, non-bulk refuse, industrial containers, etc. Bulky items are not acceptable unless they are cut to a size that allows for easy compaction by a dozer.

The remaining life of the landfill is estimated as greater than 15 years, based on the available land surrounding the site and on the estimated handling of about 1,100 cubic meters (1,440 cubic yards) of waste per day.

The Kushla landfill is also owned by Mobile County and operated by Mobile Waste Company. This site was not visited but was described by personnel at the Irvington site as being approximately one-third the size of their landfill. The expected life of this landfill is approximately 1.5 years.

The City of Mobile operates a landfill at the end of Hickory Street. The site is approximately 0.8 kilometer by 0.8 kilometer (1/2 mile by 1/2 mile) and handles only non-putrescible (not containing decomposable organics) wastes. The wastes are buried by being deposited over the side of the existing lift, compacted by a dozer, and covered. This lift method, utilizing a working face a few hundred meters long, raises the existing level of the land approximately 4 meters (12 feet).

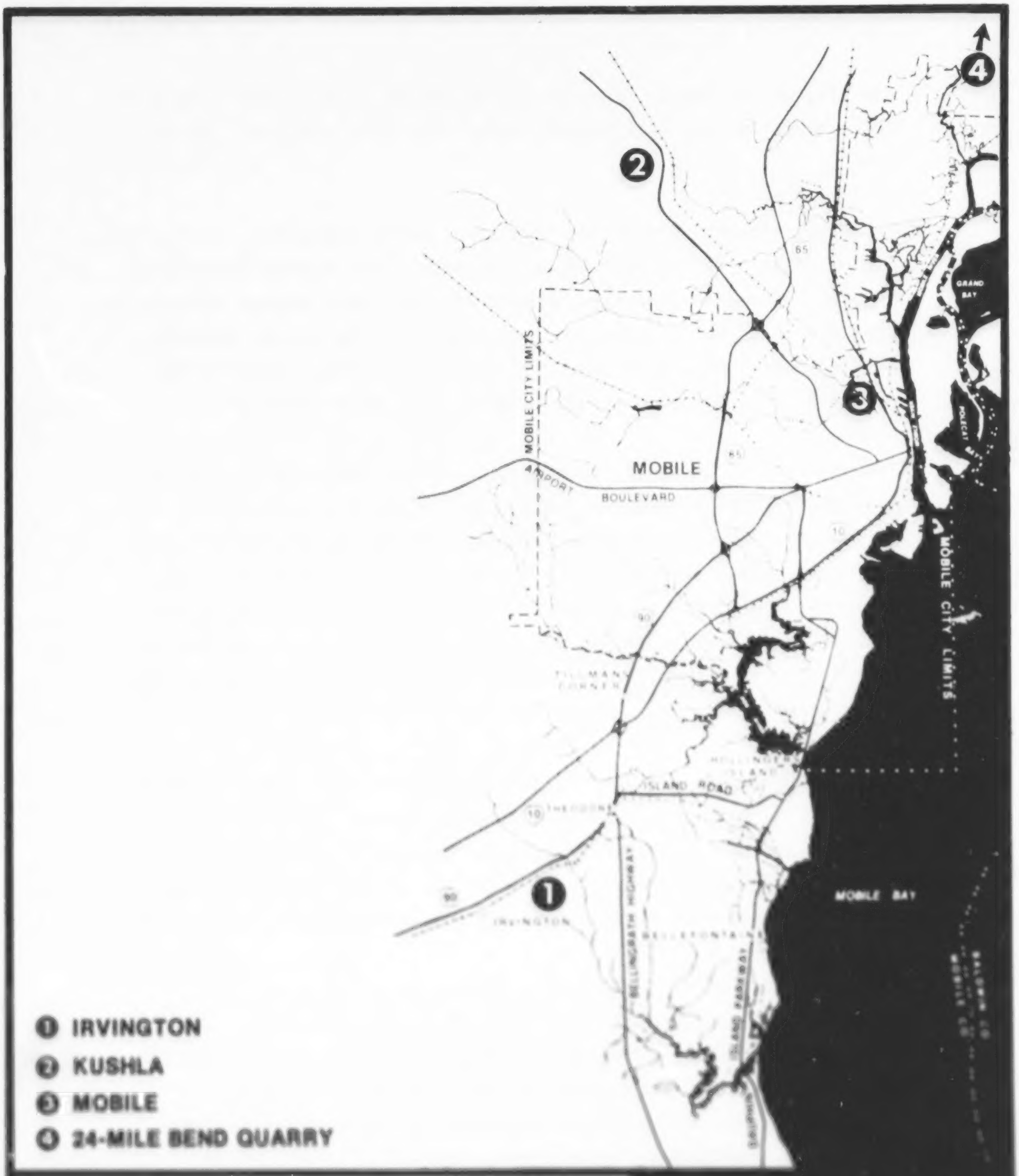
4
2
GRAND BAY
65
MOBILE CITY LIMITS
3
POLECAT BAY
MOBILE
65
AIRPORT
BOULEVARD
10
MOBILE CITY LIMITS
90
TILLMANS CORNER
HOLLINGERS ISLAND
ISLAND ROAD
10
THEODORE
1
90
IRVINGTON
BELLINGRATH HIGHWAY
BELLEFONTAINE
MOBILE BAY
BALDWIN CO
MOBILE CO
ISLAND PARKWAY
DAUPHIN
① IRVINGTON
② KUSHLA
③ MOBILE
④ 24-MILE BEND QUARRY

Figure B.S.W.1
LANDFILL SITES
(MOBILE AREA)

0 1 2
SCALE IN KILOMETERS
N

SOURCE: Environmental Science and Engineering, Inc., 1977.

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The life of the Mobile landfill was estimated to be 5 years, based on the assumption that only several more lifts were practical for the site.

Based on information received from Ideal Basic Industries, there are two other private disposal sites available. The Alabama State Docks property in downtown Mobile contains an area where general construction rubble is being deposited. No other information was obtained, but it would appear that this site is not a sanitary landfill but rather a low area being filled in with solid waste material.

The other site, which is owned by Ideal Basic Industries, is an old clay quarry approximately 32 kilometers (20 miles) north of the city of Mobile. A pit approximately 180 meters long by 120 meters wide (600 feet by 400 feet) is being filled with waste alkali kiln dust from their existing wet process cement plant. Since it was a clay quarry, the bottom of the pit is sealed by the clay and leachate is not a problem. There is sufficient land [400 hectares (1,000 acres)] to continue such operations for at least 15 years.

Mobile County does not have a municipal incinerator, resource recovery facility, or hazardous waste handling facility. The Mobile County Board of Health does issue permits for burning of land clearing wastes. Such burning would be permissible in the Theodore Industrial Park area, with some restrictions for air pollution and fire hazard prevention.

The present conditions of solid waste disposal are expected to continue through 1980. Although the present sites are limited and additional landfill sites have not been announced, it is not anticipated that a significant municipal incineration or resource recovery operation would be economical.

With the recent state and federal solid waste legislation, the aspect of providing adequate control of hazardous or toxic substances is anticipated. Industrial or municipal waste so classified will probably be disposed of in special sealed and leachate-treated landfills or high temperature incinerators.

QUARRY SITE

In Monroe County, there is only one approved sanitary landfill. It is located near Monroeville (see Figure B.S.W.2) and handles putrescible, non-putrescible, and bulky wastes. The site is approximately 10 hectares (25 acres) and operates a multi-lift system of disposal. The wastes are dropped over the side of an existing lift, compacted by dozer, and covered daily. The working face is approximately 30 meters long and 15 meters wide (100 feet by 50 feet). The site has been operating since 1972 and is estimated to have another 2 to 3 years of capacity remaining.

Upon completion of this area, the county plans to use surrounding property for future operations. Since the area is rural, there appears to be adequate land for well over 15 years of use.

As in Mobile County, it is anticipated that hazardous wastes will be treated separately by special sealed landfills or by incineration. However, due to the rural nature of the area, such facilities will probably not be located in Monroe County.

The burning of land clearing wastes, which is permitted by the Alabama Air Pollution Control Commission, is presently the only practical method available for handling large quantities of trees and brush.

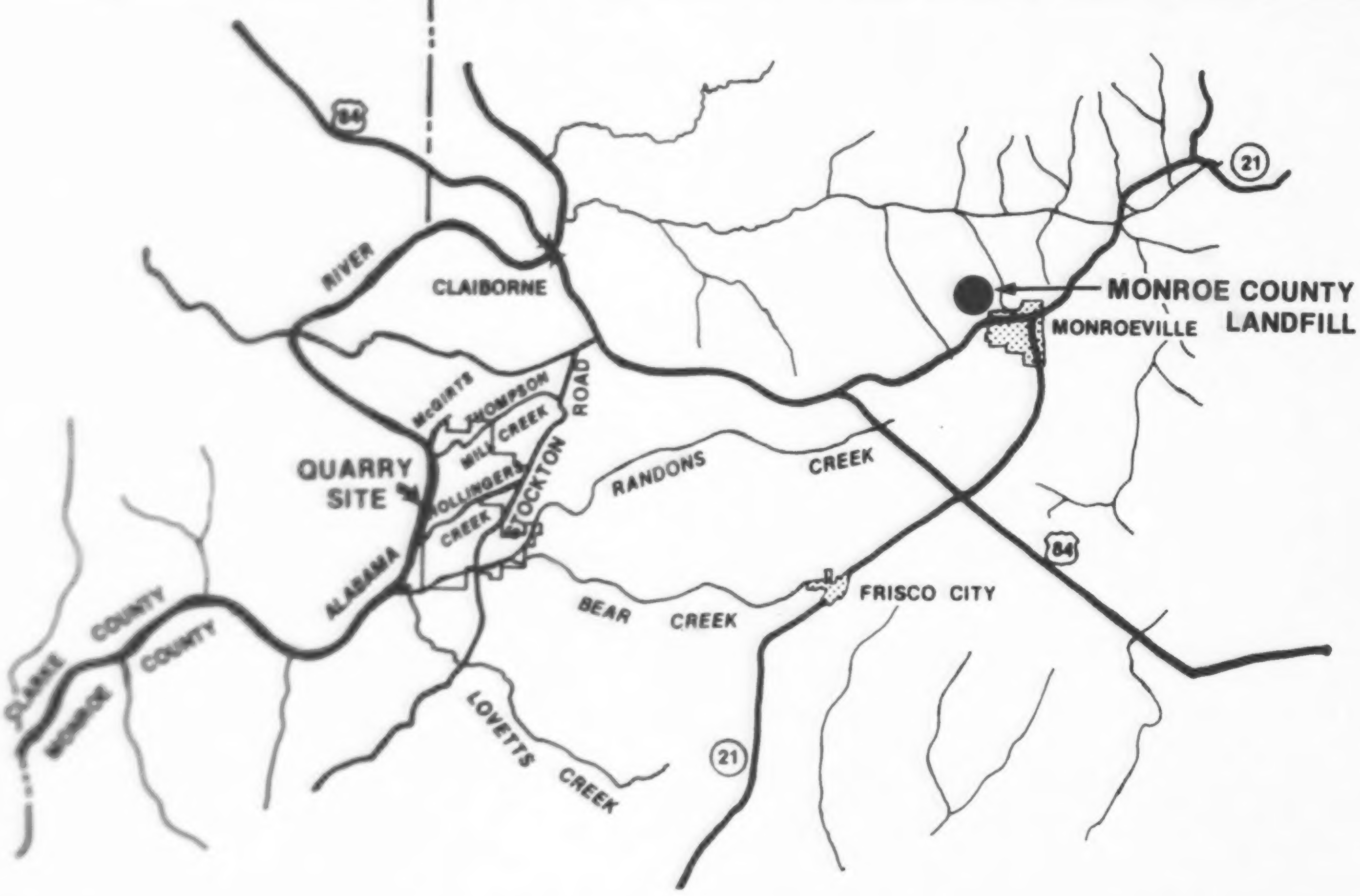
MONROE COUNTY LANDFILL
MONROEVILLE
21
84
CLAIBORNE
RIVER
McGIRTS
THOMPSON
MILL CREEK
HOLLINGERS CREEK
STOCKTON ROAD
QUARRY SITE
ALABAMA
RANDONS CREEK
BEAR CREEK
FRISCO CITY
LOVETTS CREEK
CLARKE COUNTY
MONROE COUNTY
0 5 10
SCALE IN KILOMETERS
N

Figure B.5.W.2
LANDFILL SITE
(MONROE COUNTY)

SOURCE: Environmental Science and Engineering, Inc., 1977.

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APPENDIX B. BASELINE

GEOTECHICAL ASPECTS

REGIONAL SETTING

GEOMORPHOLOGY

In southern and western Alabama outside of the influence of the area of the Appalachian Mountains, the coastal plain area has been designated as the East Gulf Coastal Plain physiographic province. This physiographic province is divided into eight subprovinces on the basis of geomorphology; the proposed plant and quarry sites are in the Southern Pine Hills subprovince (see Figures B.G.1 and B.G.2).

STRATIGRAPHY

The geology of southern Alabama is characterized by a series of sedimentary rocks which range in geologic age from Lower Cretaceous to Holocene and overlie a basement complex of crystalline rocks. The sediments consist mainly of limestone, sandstone, shale, sand, clay, and gravel with some salt and anhydrite at depth. The geologic column according to Chermock (1974) is given in Figure B.G.3.

Generally the formations dip and thicen toward the Gulf of Mexico (southwest) with the older formations having a greater dip than the younger ones. Because of this dip toard the Gulf, the older formations tend to crop out at the surface at a reater distance from the coast than do the younger ones. In Mobile ounty, sediments and rocks of Holocene through Miocene age are expoed, whereas farther north in Monroe County, sediments and rocks as old as lower Eocene crop out. This general pattern is disrupted by the doosition of Pleistocene and Holocene river channel and terrace depsits over older sediments throughout southern Alabama.

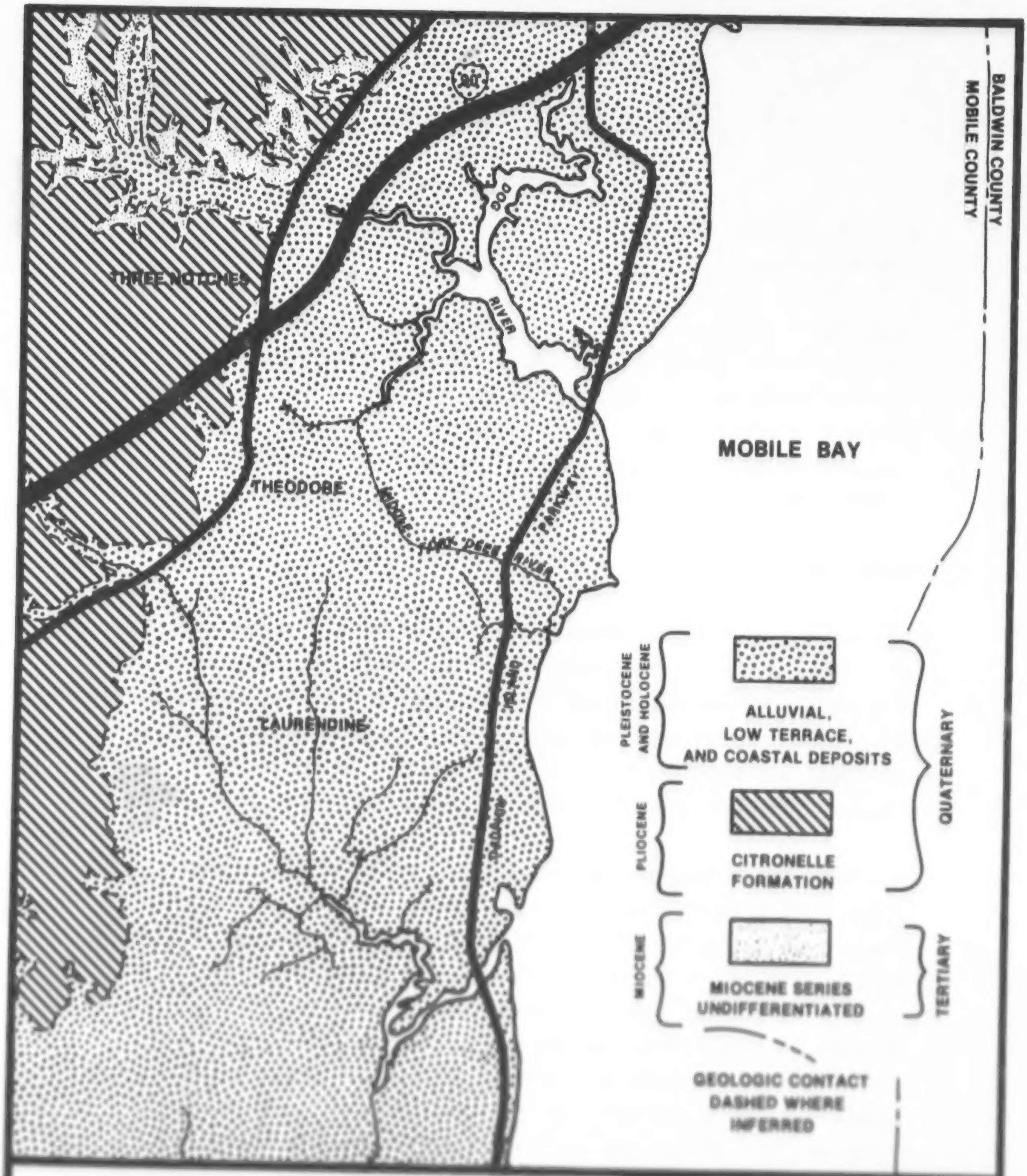
BALDWIN COUNTY
MOBILE COUNTY
90
DOG
RIVER
THREE NOTCHES
MOBILE BAY
THEODORE
DEER RIVER
PARKWAY
ISLAND
LAURENDINE
DAUPHIN
PLEISTOCENE AND HOLOCENE
ALLUVIAL, LOW TERRACE, AND COASTAL DEPOSITS
PLIOCENE
CITRONELLE FORMATION
QUATERNARY
MIOCENE
MIOCENE SERIES UNDIFFERENTIATED
TERTIARY
GEOLOGIC CONTACT DASHED WHERE INFERRED
0
5
SCALE IN KILOMETERS
N

Figure B.G.1
SURFICIAL GEOLOGY OF STUDY AREA
(MOBILE COUNTY)

SOURCE: Reed, Philip C., 1971.

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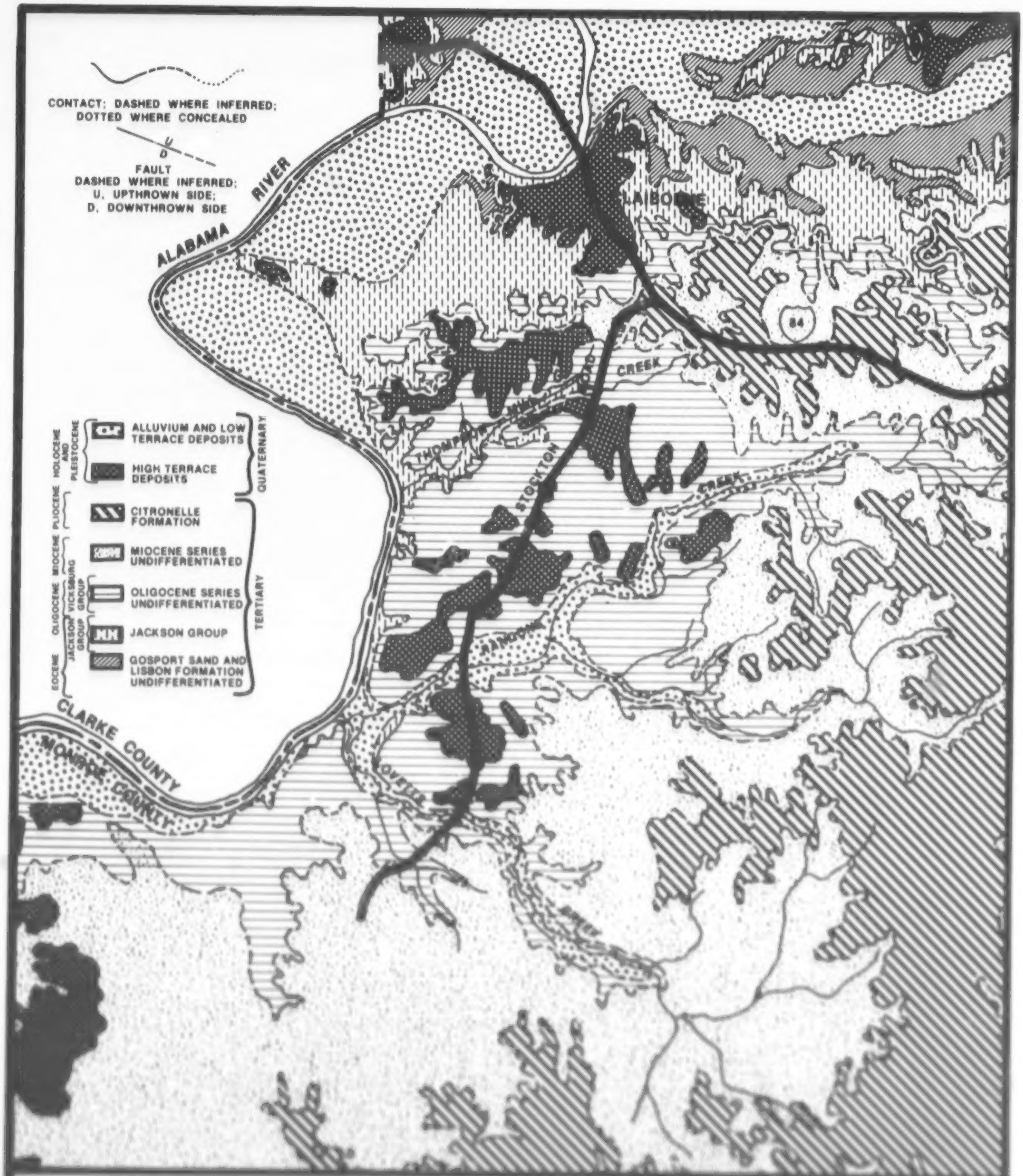
CONTACT; DASHED WHERE INFERRED; DOTTED WHERE CONCEALED
U
D
FAULT
DASHED WHERE INFERRED;
U, UPTHROWN SIDE;
D, DOWNTHROWN SIDE
ALABAMA RIVER
CLAIBORNE
84
CREEK
THOMPSON
STOCKTON
CREEK
RANDONS
CLARKE COUNTY
MONROE COUNTY
HOLOCENE AND PLEISTOCENE
ALLUVIUM AND LOW TERRACE DEPOSITS
HIGH TERRACE DEPOSITS
QUATERNARY
PLIOCENE
CITRONELLE FORMATION
MIOCENE
MIOCENE SERIES UNDIFFERENTIATED
OLIGOCENE
VICKSBURG GROUP
OLIGOCENE SERIES UNDIFFERENTIATED
JACKSON GROUP
JACKSON GROUP
EOCENE
GOSPORT SAND AND LISBON FORMATION UNDIFFERENTIATED
TERTIARY

Figure B.G.2
SURFICIAL GEOLOGY OF STUDY AREA
(MONROE COUNTY)

0 5
SCALE IN KILOMETERS

SOURCE: Scott, John C., 1971.

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Erathem	System	Series	Rock units
Cenozoic	Quaternary	Holocene	Undifferentiated alluvial, deltaic, estuarine and coastal sediments.
		Pleistocene	Alluvial terrace deposits
	Tertiary	Pliocene	Citronelle Formation
		Miocene	Miocene undifferentiated
		Oligocene	Chickasawhay Limestone
			Vicksburg Group
		Eocene	Jackson Group
			Claiborne Group
			Wilcox Group
		Paleocene	Midway Group
Mesozoic	Cretaceous	Upper	Selma Group
			Eutaw Formation
			Tuscaloosa Group
		Lower	Lower Cretaceous undifferentiated
	Jurassic	Upper	Cotton Valley Group
			Haynesville Formation
			Smackover Formation
		Middle	Norphlet Formation
			Louann Salt
	Triassic		Werner Formation
			Eagle Mills Formation
– ? – ? –	– ? – ? –	– ? – ? –	Undifferentiated sediments
			Basement

Figure B.O.3
STRATIGRAPHIC COLUMN OF COASTAL ALABAMA

SOURCE: Chermock, R.L., 1974.

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The rocks of greatest economic value are the limestones and some of the sands and gravels. The Oligocene limestones are a source of agricultural lime, and Oligocene and Eocene limestones are suitable for the manufacture of cement and other products. Sand and gravel are potential sources of road building material (Scott, 1972).

TECTONIC ACTIVITY

The proposed plant site is relatively inactive tectonically. Since records have been maintained, only 12 earthquakes have been recorded in the state. None of these has been classified by NOAA as a major occurrence (U.S. Environmental Data Center, 1973). NOAA places the plant and quarry sites within the lowest seismic risk classification.

PLANT SITE

GEOMORPHOLOGY

The proposed plant site is situated in the Lime Hills subprovince of the East Gulf Coastal Plain physiographic province. This subprovince consists generally of a southward sloping dissected plain which gives way within a few miles to coastal lowlands along the margins of Mobile Bay.

More specifically, the plant site is in the Pine Meadows Subdivision of the Southern Pine Hills. This area is characterized by low, smooth hills developed on floodplain, terrace, and beach deposits (Copeland, 1968). Elevations on the site range from 6 meters (20 feet) above mean low water at a dune-shaped feature paralleling the channel to sea level along the channel and marsh (see Figures B.G.4 and B.G.5). The topography is illustrated in Figure B.G.6.

Most of the drainage for the property is through the North Fork Deer River; the remainder is directly into the bay along the barge canal. The water table ranges from at the surface to nearly 6 meters (20 feet) below land surface.

Mobile Bay in the vicinity of the proposed plant site exhibits little bathymetric relief except for the Mobile ship channel. The bottom gently slopes for 8 kilometers (5 miles) eastward into the bay and then becomes relatively flat (see Figure B.G.7). Submerged sandbars extend from the shore into the estuary; one of the larger bars is south of the plant site near Fowl River (Chermock, 1974).

The main ship channel is currently 120 meters (400 feet) wide with a control depth of 11 meters (37 feet). Spoil banks with a relief of 2 meters (6 feet) or more extend along both sides of the channel from Great Point to Mobile.

EAST VIEW

WEST VIEW

Figure B.G.4
PHOTOS OF THE THEODORE PLANT SITE ALONG THE NORTH FORK DEER RIVER FROM THE BRIDGE ON DAUPHIN ISLAND PARKWAY

SOURCE: Environmental Science and Engineering, Inc., 1977.

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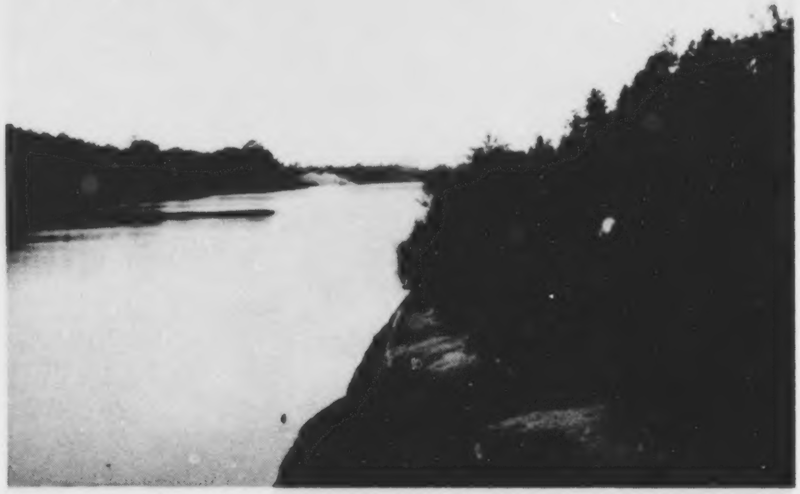

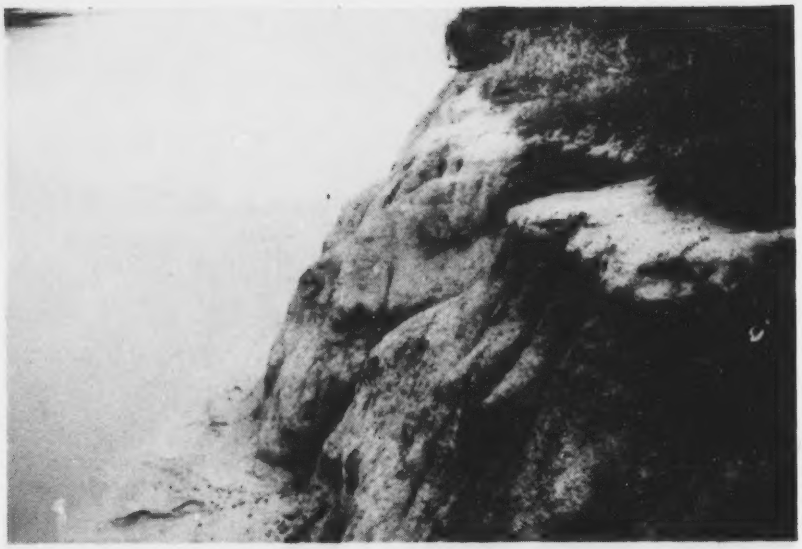

Figure B.G.5
PHOTOS OF THE THEODORE PLANT SITE ALONG THE BARGE CANAL

SOURCE: Environmental Science and Engineering, Inc., 1977.

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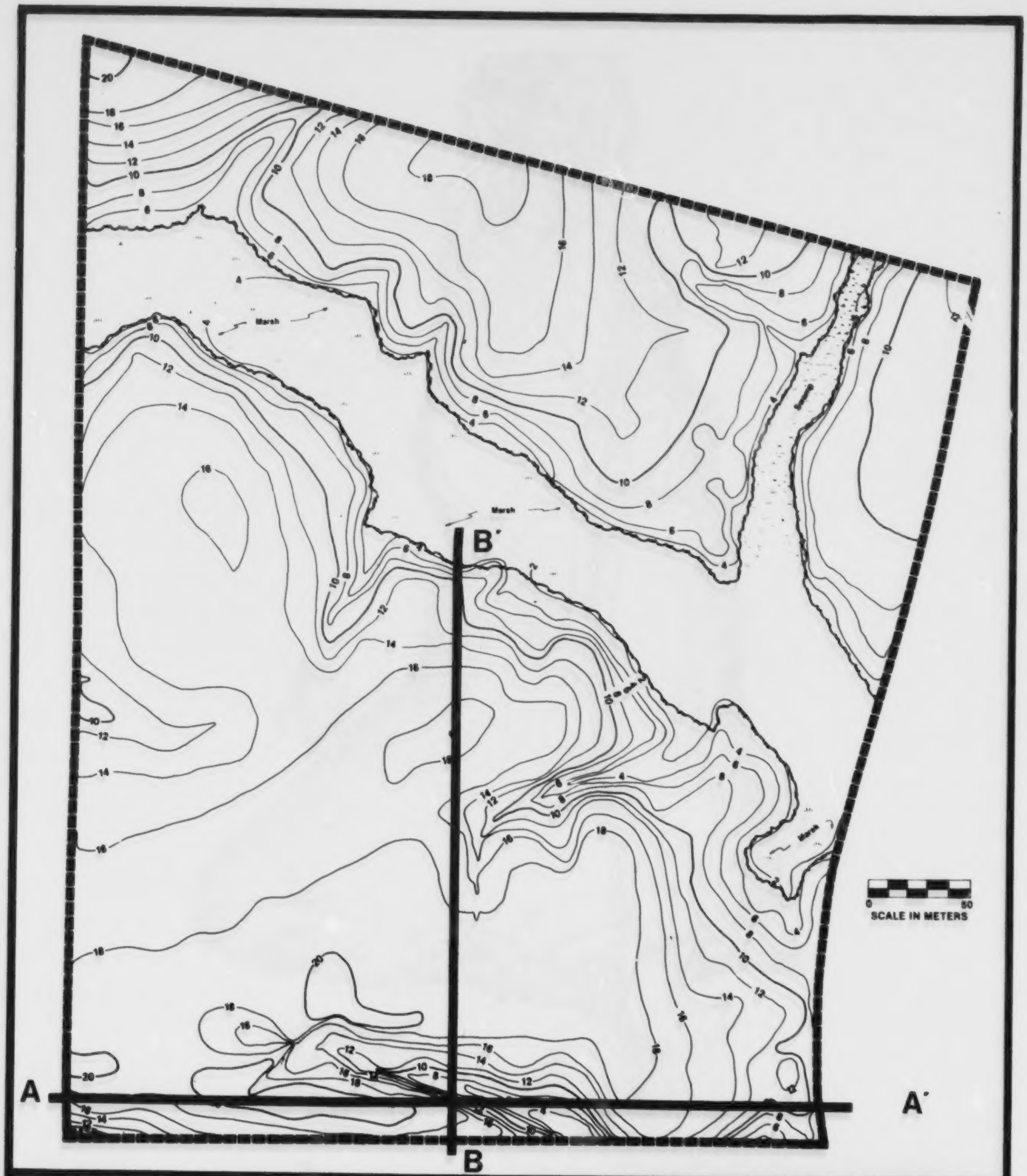
B'
A
A'
B
Marsh
Marsh
Marsh
0
50
SCALE IN METERS

Figure B.G.6
TOPOGRAPHIC SURVEY OF THE THEODORE PLANT SITE

***TOPOGRAPHIC MAP KEYED TO CROSS SECTIONS PRESENTED IN FIGURE B.G.10**

SOURCE: H. K. Ferguson Associates, 1975.

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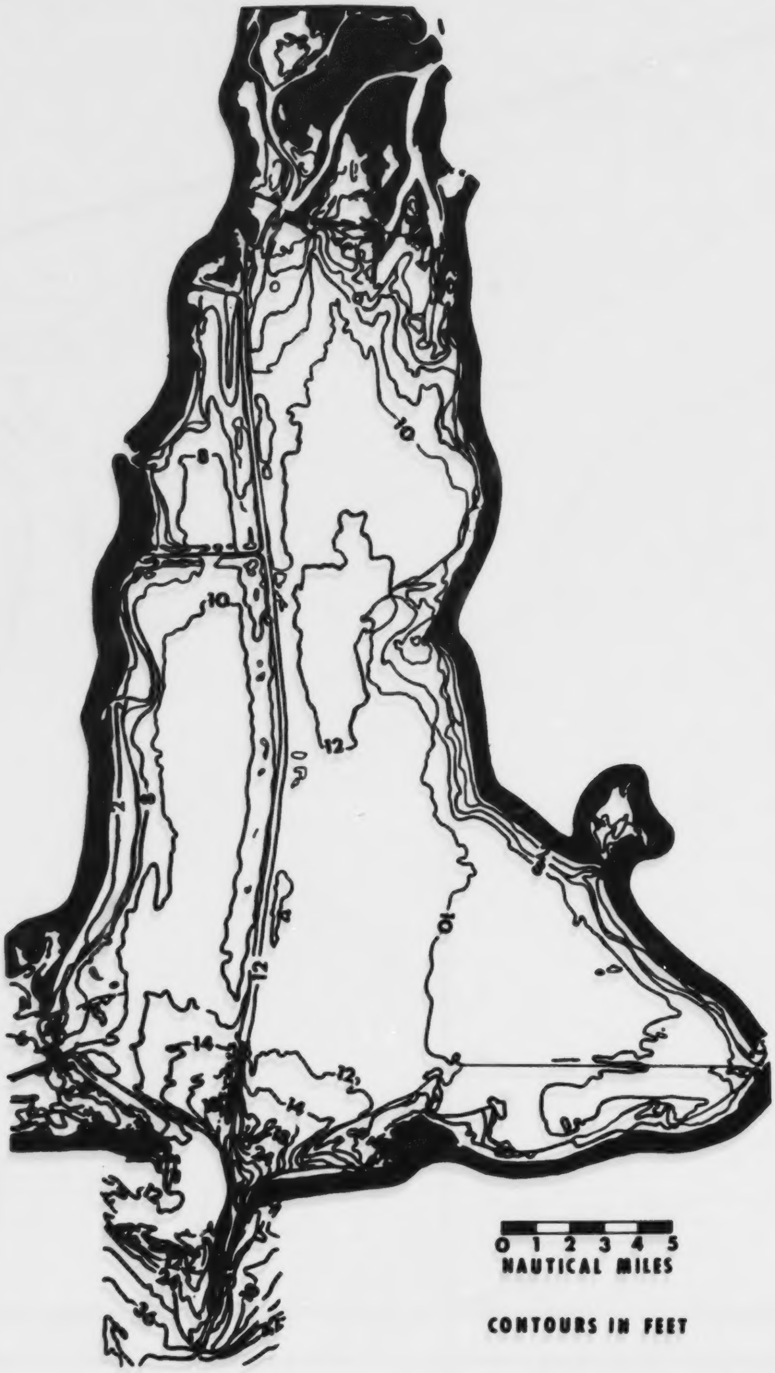
8
10
10
12
12
10
8
14
12
14
0 1 2 3 4 5
NAUTICAL MILES
CONTOURS IN FEET

Figure B.G.7
MOBILE BAY BATHYMETRY
(AFTER RYAN, 1969)

SOURCE: Chermock, R.L., 1974.

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The bathymetry of the bay is undergoing constant change (see Figure B.G.8). In the 110-year period ending in 1961, the depth changes within an 8-kilometer (5-mile) radius of the proposed site range from 0.3 to 2.1 meters (1 to 7 feet) (Chermock, 1974).

STRATIGRAPHY

Sediments and rocks exposed at the surface in Mobile County range in age from Miocene to Holocene (recent). The older units are exposed in a dendritic pattern along creeks where the overlying Citronelle Formation has been eroded. Miocene sediments are exposed as far south as the southern border of the Brooklyn Air Force Base. Quaternary alluvium occurs adjacent to the bay and along major creeks.

The plant site is on Quaternary alluvium. The Citronelle Formation occurs at the surface approximately 7 kilometers (4 miles) west of the plant site. The formations and their lithologies are summarized in Table B.G.1.

Present sedimentation in the bay area includes alluvial, coastal, estuarine, and deltaic deposits. The general distribution of these deposits, which range in size from gravels to clays, is presented in Figure B.G.9.

Test holes at the site reveal at least 41 meters (135 feet) of unconsolidated sands, silts, and clays. Wells close to the site indicate that at least 210 meters (700 feet) of unconsolidated sediments lie below the area. Figure B.G.10 shows two cross sections of the site.

Because of a thick section of clayey material, problems with settling resulting from compaction can be expected. Preliminary computations by Palmer and Baker (1975) indicate that settling in the limestone stockpile area will be in excess of 2.5 meters (8 feet) for compressible strata approximately 20 meters (65 feet) thick.

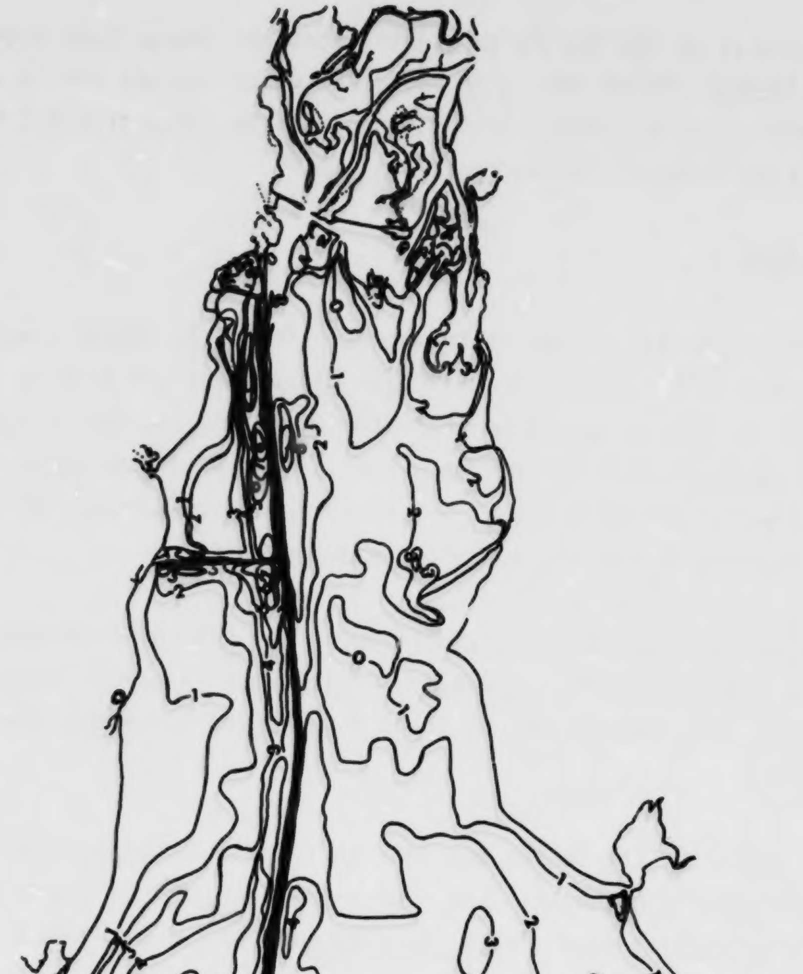
0 1 2 3 4 5
NAUTICAL MILES
ISOPACHS IN FEET

Figure B.G.8
MOBILE BAY DEPTH CHANGES BETWEEN 1849-1851 AND 1960-1961 (AFTER RYAN, 1969)

SOURCE: Chermock, R.L., 1974.

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Table B.G.1. Geologic Units and their Water-Bearing Properties

QUARRY SITE

Series	Geologic Units	Thickness (feet)	Lithology	Yield	Quality of Water
Holocene and Pleistocene	Alluvium, low-terrace, and coastal deposits	0-150	Sand, white, gray, orange, and red, very fine to coarse-grained, contains gravel in places; gray and orange sandy clay.	Will yield 10 gpm where saturated sands are of sufficient thickness. Potential source of 0.5 to 1 mgd per well in the Mobile River basin.	Water generally suitable for most uses, but commonly contains iron in excess of 0.3 mg/l and may be sufficiently acidic to be corrosive. Locally, in areas close to Mobile Bay and Mississippi Sound, water is very hard, has high chloride and dissolved-solids contents, and contains iron in excess of 0.3 mg/l.
	High-terrace deposits	0-40		Will yield 10 gpm or more where saturated sands are of sufficient thickness.	Probably soft and low in dissolved solids. May contain iron in excess of 0.3 mg/l.
Pliocene	Citronelle Formation	0-200	Sand, brown, red, and orange, fine- to coarse-grained, gravelly in places, contains clay balls and partings; gray, orange, and brown lenticular sandy clay, ferruginous cemented sandstone.	Miocene-Pliocene aquifer Will yield 1 mgd or more per well	Water generally is soft and low in dissolved solids but may contain iron in excess of 0.3 mg/l and may be sufficiently acidic to be corrosive. In areas adjacent to Mobile River, Mobile Bay, and Mississippi Sound, water may have a dissolved-solids content that exceeds 1,000 mg/l, a sulfurous odor, and and chloride content that exceeds 500 mg/l.
Miocene	Miocene Series undifferentiated	400-3,400	Sand, gray, orange, and red, very fine to coarse-grained, contains gravel in places; gray thin-bedded to massive sandy silty clay; gray thin-bedded limestone in subsurface.		

Source: Reed, P.C., and J.F. McCain, 1972.

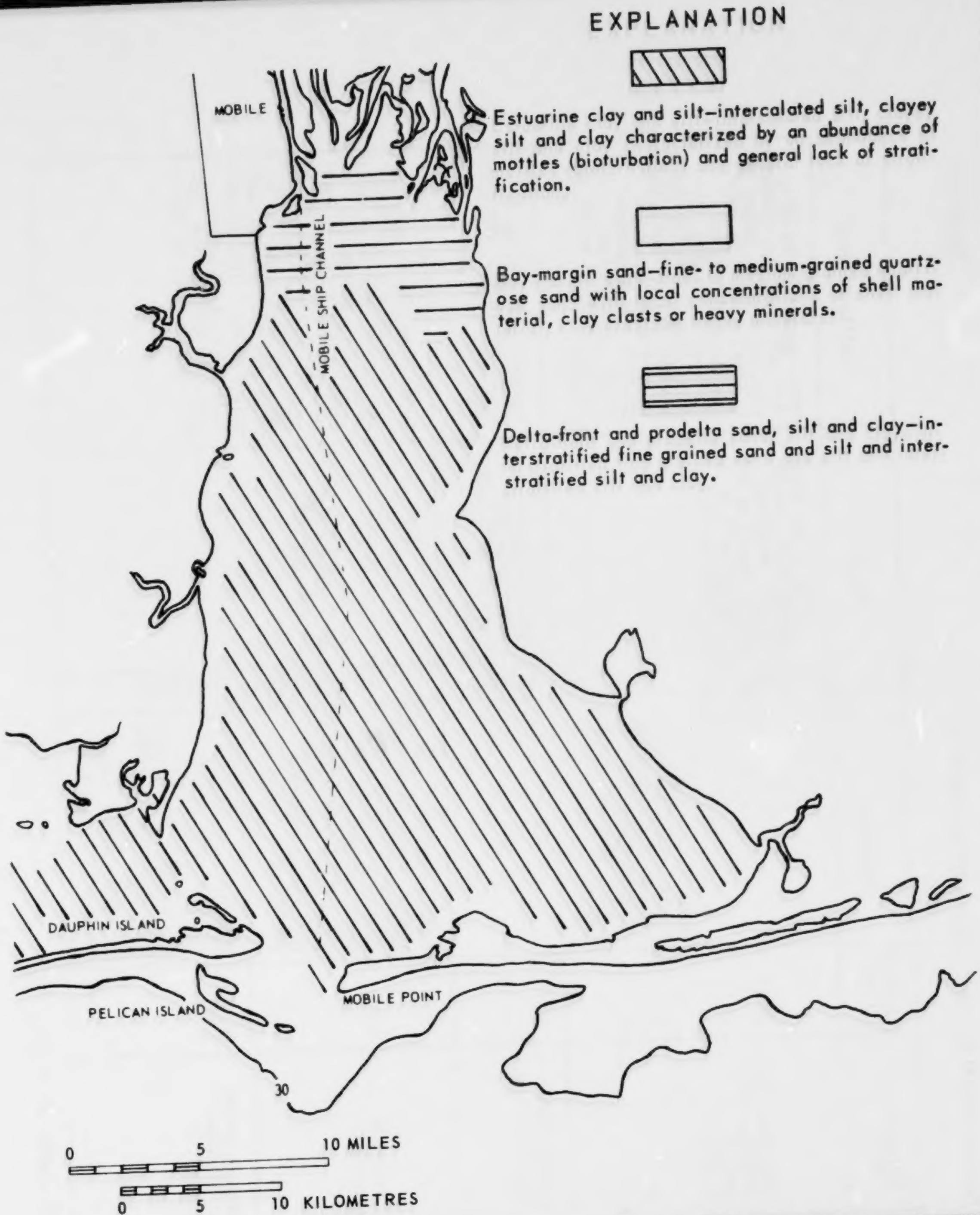
EXPLANATION
▨ Estuarine clay and silt—intercalated silt, clayey silt and clay characterized by an abundance of mottles (bioturbation) and general lack of stratification.
☐ Bay-margin sand—fine- to medium-grained quartzose sand with local concentrations of shell material, clay clasts or heavy minerals.
▤ Delta-front and prodelta sand, silt and clay—interstratified fine grained sand and silt and interstratified silt and clay.
MOBILE
MOBILE SHIP CHANNEL
DAUPHIN ISLAND
PELICAN ISLAND
MOBILE POINT
30
0
5
10 MILES
0
5
10 KILOMETRES

Figure B.G.9
SEDIMENTATION DISTRIBUTION, MOBILE BAY

SOURCE: Chermock, R.L., 1974.

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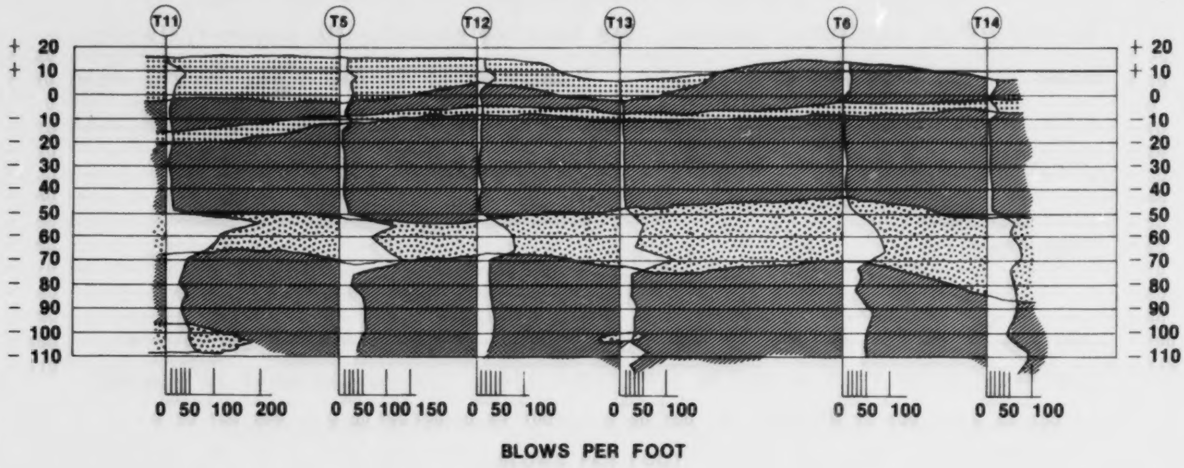
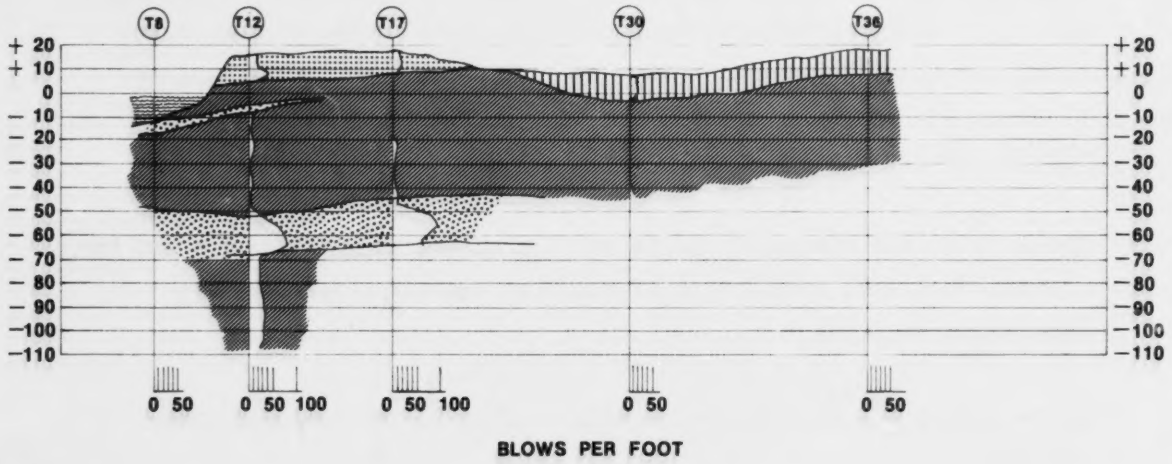

T11
T5
T12
T13
T6
T14
+ 20
+ 10
0
− 10
− 20
− 30
− 40
− 50
− 60
− 70
− 80
− 90
− 100
− 110
0 50 100 200
0 50 100 150
0 50 100
0 50 100
0 50 100
0 50 100
BLOWS PER FOOT

A-A′

NOTE:

DATA CONCERNING THE VARIOUS STRATA HAVE BEEN OBTAINED AT BOREHOLE LOCATIONS ONLY. THE SOIL BETWEEN BOREHOLES HAS BEEN INFERRED AND SO MAY VARY FROM THAT SHOWN.

▨ SILTY CLAY
▤ SILTY SAND
▥ CLAYEY SILT
▦ SAND
(T12) BORING


T8
T12
T17
T30
T36
+20
+10
0
−10
−20
−30
−40
−50
−60
−70
−80
−90
−100
−110
0 50
0 50 100
0 50 100
0 50
0 50
BLOWS PER FOOT

B-B′

Figure B.G.10
CROSS SECTIONS OF THE THEODORE PLANT SITE

*CROSS SECTIONS KEYED TO TOPOGRAPHIC MAP PRESENTED IN FIGURE B.G.6

SOURCE: Palmer and Baker Engineering, Inc., 1975.

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The surface material, which consists largely of silts and clays, has a high bearing capacity; however, the bearing capacity is severely reduced when the soil is wet or vibrated. The material is not suitable for road fill unless stabilized in some manner and may have to be removed in some areas where structural integrity is necessary.

STRUCTURE

The geologic formations in the area exhibit no outstanding structural features other than a gentle southwest slope toward the Gulf of Mexico. Subsurface data indicate no expression of tectonic activity.

GROUND WATER

Groundwater supplies are available from permeable sands of Miocene through Holocene age throughout Mobile County. The principal producing zones are in the Miocene-Pliocene aquifer. Individual beds in the aquifer are generally 15 to 30 meters (50 to 100 feet) thick and are separated by lenticular clays which may be as much as 36 meters (120 feet) thick. Locally, sands and clays both thicken and thin unpredictably (Reed and McCain, 1972). At the plant site the base of the Miocene-Pliocene aquifer is at about 375 meters (1,250 feet) below msl (Reed and McCain, 1972).

Recharge of the Miocene-Pliocene aquifer occurs by infiltration and by downdip flow from areas north of Mobile. Aquifer properties are summarized in Table B.G.1.

Wells within a 8.3-kilometer (5-mile) radius of the proposed site include:

1.	Alabama Refining Company	(Sec. 12, T6S, R2W)
2.	Mobile Water and Fire Authority District	(Sec. 3, T6S, R2W)
3.	Mobile Water and Fire Authority District	(Sec. 4, T6S, R2W)
4.	Nan Grey School	(Sec. 4, T6S, R2W)
5.	McWane Cast Steel Pipe Company	(Sec. 7, T6S, R1W)

6.	McWane Cast Steel Pipe Company	(Sec. 7, T6S, R1W)
7.	Mobile Industry Board	(Sec. 4, T6S, R2W)
8.	Bellefontaine Nursery Company	(Sec. 31, T6S, R1W)
9.	Riverview Nursery Company	(Sec. 6, T7S, R1W)
10.	Bayley's Ranch Club	(Sec. 6, T7S, R1W)
11.	W.D. Nichols	(Sec. 2, T7S, R2W)
12.	H.J. Sonneborn	(Sec. 12, T7S, R2W)

All of these wells range from approximately 15 to 150 meters (50 to 500 feet) and tap either alluvial [up to 36 meters (120 feet)] or Miocene units. Yields for wells drawing from alluvium deposits range up to 5.7 lps (90 gpm); wells drawing from Miocene deposits yield from 2.5 to 21 lps (40 to 330 gpm).

Wells drawing water from the Miocene-Pliocene aquifer generally obtain good quality soft water; however, local water quality problems do occur. High iron concentrations, corrosiveness, high dissolved solids, high chloride concentrations, and sulfurous odor may occur due to local conditions such as proximity to a river or to the bay. At Theodore, the base of water with a dissolved solids concentration of less than 1,000 milligrams per liter is approximately 240 meters (800 feet) below msl (Reed and McCain, 1972).

Studies by Robinson, et al. (1956), indicate that chloride concentrations in the ground water in the vicinity of Mobile are increasing, indicating progressive saltwater encroachment. The two wells of record closest to Theodore and near the bay (Section 7, T6S, R1W) show chloride concentrations ranging from 4.8 to 8.2 milligrams per liter. This concentration does not seem to indicate saltwater intrusion in the plant area. Another well in Section 4, T6S, R2W showed a higher chloride concentration of 240 milligrams per liter (Alabama Department of Public Health, Bureau of Environmental Health, 1977; Reed and McCain, 1972).

QUARRY SITE

GEOMORPHOLOGY

The proposed quarry site is also located in the Lime Hills subprovince, an area of a southward sloping plain dissected by stream and river action. In Monroe County relief is greatest in the northern part of the county where streams flowing to the Alabama River drop to base level in relatively short distances (Copeland, 1968).

The site is situated along the outside of a meander (cut bank) on the east side of the Alabama River. The deepest part of the river in this vicinity is along the eastern bank adjacent to Marshalls Bluff. Depths of about 6 meters (20 feet) have been measured.

Elevations within the property range from 3 meters (10 feet) msl to over 60 meters (200 feet) msl, with the greatest relief in the area near the river.

Solution (karst) features occur in the area as closed depressions (sinkholes). Surface drainage of the site is generally westward to the Alabama River by way of several subbasins drained by Thompson Mill (also known as Marshalls), Hollinger, and Randons creeks. Figure B.G.11 shows the quarry site and indicates the locations of the topographic profiles along Thompson Mill Creek and Hollinger Creek which are given in Figure B.G.12.

The drainage channels in the area form patterns typical of humid areas with relatively flat-lying limestone near the surface. The drainage is dendritic. Examples of stream channel shape and size are given in Figure B.G.13.

As indicated by the topographic map, Thompson Mill Creek meanders more and has a lesser gradient [7.5 meters per kilometer (7.5 feet per 1,000 feet of channel)] than Hollinger Creek. Hollinger Creek has a wider floodplain at the confluence with the Alabama River.

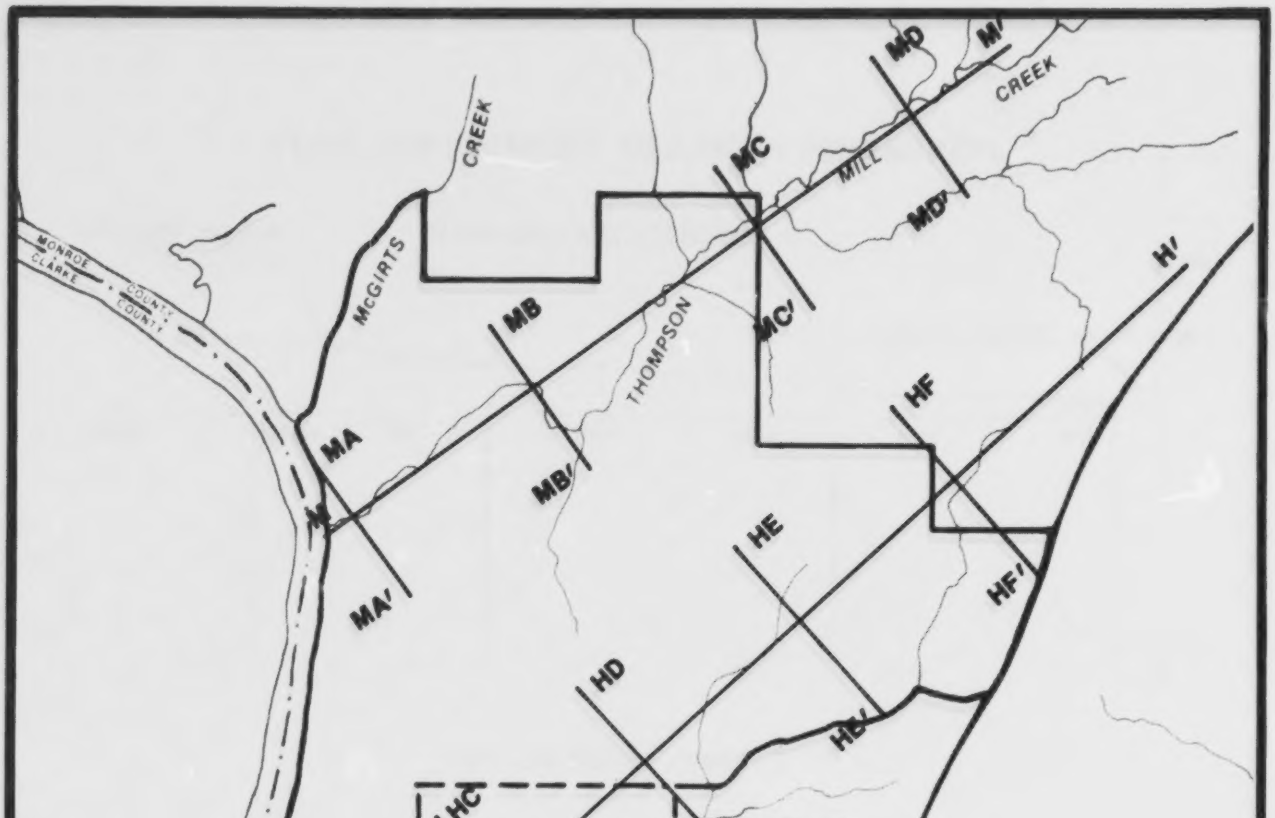
MD
M'
CREEK
MILL
CREEK
MC
MD'
CREEK
MONROE
CLARKE
COUNTY
COUNTY
McGIRTS
MB
THOMPSON
MC'
H'
HF
MA
M
MB'
HE
HF'
MA'
HD
HE'
HC
HD'
RIVER
HB
CREEK
HC'
HOLLINGER
HA
H
HB'
HA'
CREEK
BEAR
ALABAMA
RANDONS
0
0.5
1
SCALE IN KILOMETERS

Figure B.G.11
PROPOSED QUARRY SITE*

***MAP KEYED TO TOPOGRAPHIC PROFILES PRESENTED IN FIGURE B.G.12**

SOURCE: USGS, 1974.
Environmental Science and Engineering, 1977.

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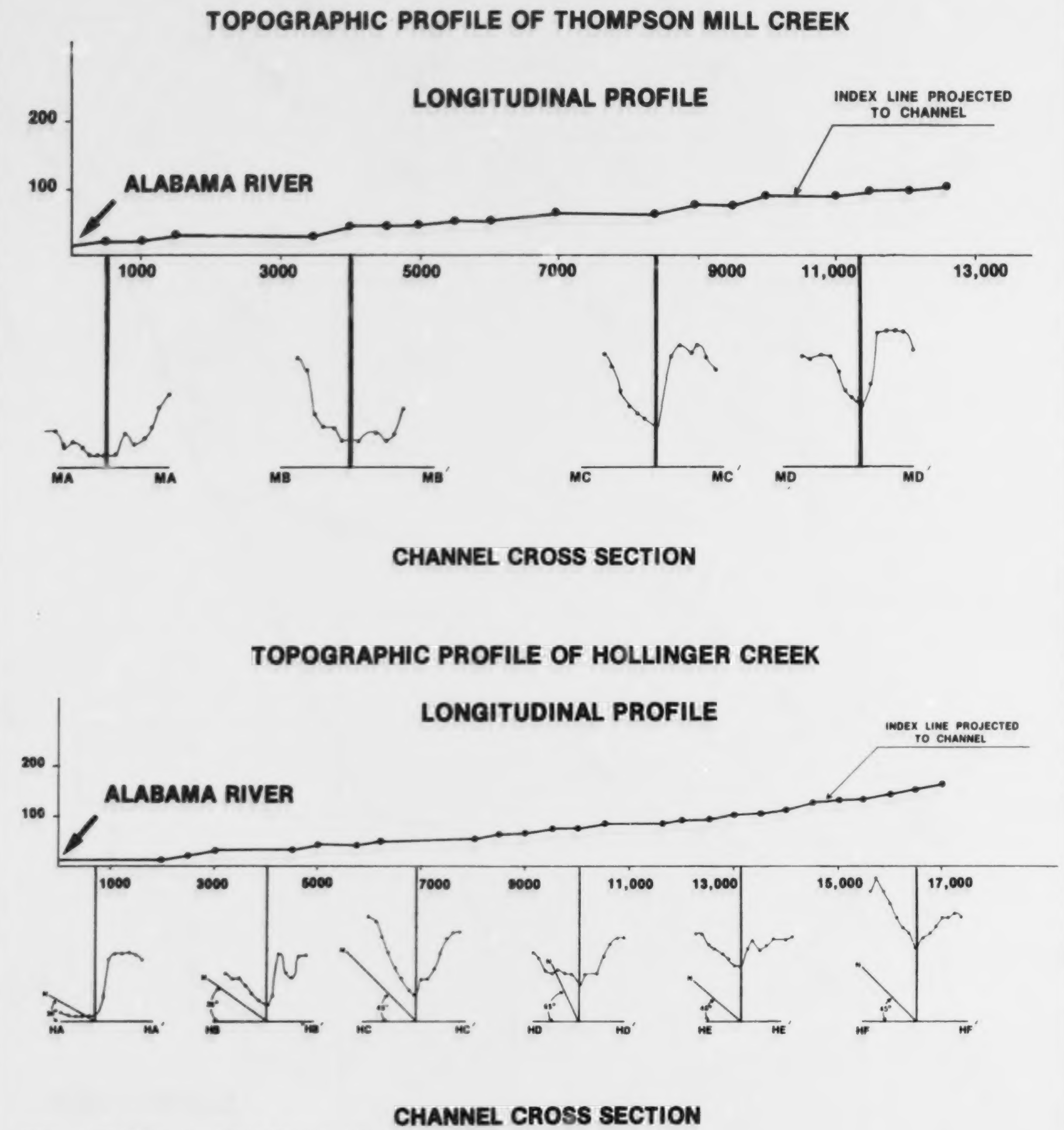

TOPOGRAPHIC PROFILE OF THOMPSON MILL CREEK

LONGITUDINAL PROFILE

CHANNEL CROSS SECTION

TOPOGRAPHIC PROFILE OF HOLLINGER CREEK

LONGITUDINAL PROFILE

CHANNEL CROSS SECTION

NOTE: HORIZONTAL AND VERTICAL SCALES IN FEET

Figure B.G.12
LONGITUDINAL AND CROSS SECTIONAL TOPOGRAPHIC PROFILES*
1 THOMPSON MILL CREEK 2 HOLLINGER CREEK
*TOPOGRAPHIC PROFILES KEYED TO MAP PRESENTED IN FIGURE B.G.11
SOURCE: Environmental Science and Engineering, Inc., 1977.

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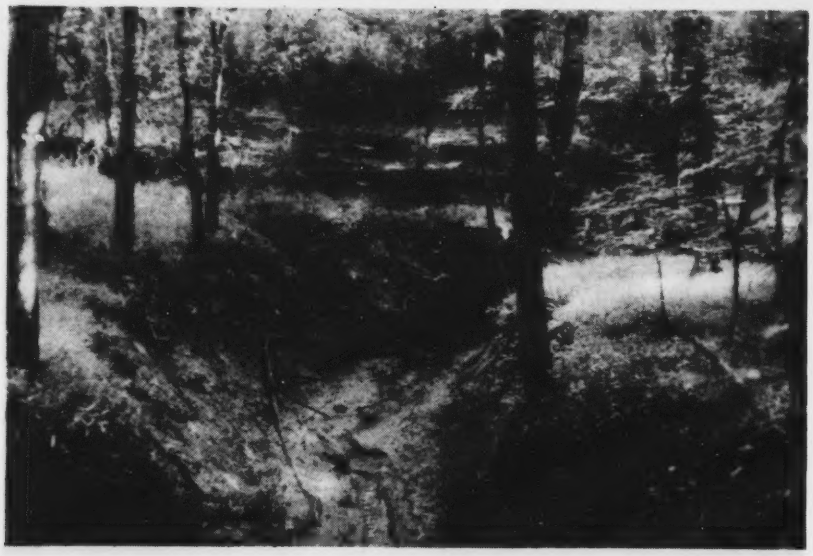

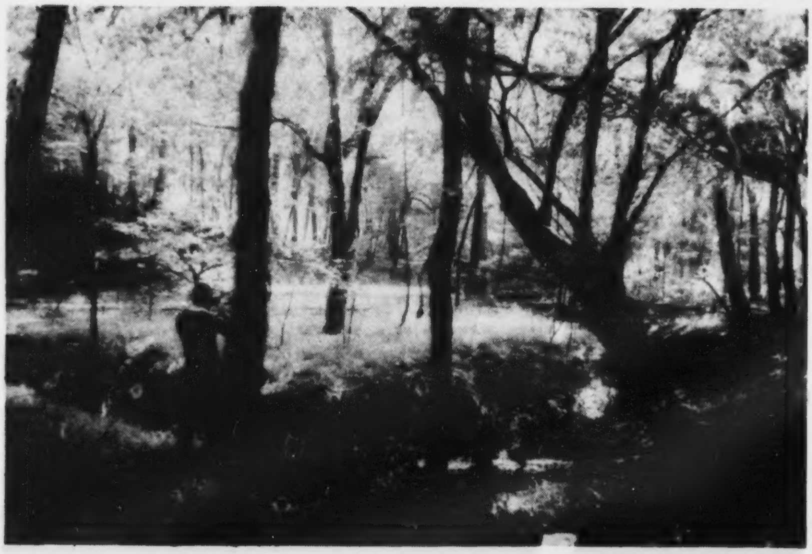

Figure B.G.13
MINOR TRIBUTARY TO THE ALABAMA RIVER APPROXIMATELY 200 FEET FROM THE CONFLUENCE IN THE VICINITY OF MARSHALLS BLUFF

SOURCE: Environmental Science and Engineering, Inc., 1977.

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Thompson Mill Creek tends to stay close to the southern boundary of its stream valley. The landforms adjacent to the creek exhibit considerable relief. Steep valley walls extend to the upper reaches of the creek. Much of the streambed is over bedrock and/or coarse gravel. The lack of turbidity in this rather fast-moving stream indicates a paucity of fine materials (silt, clay) along the bed and banks.

STRATIGRAPHY

In the vicinity of the quarry site, sedimentary strata ranging from upper Eocene limestone to Holocene terrace and alluvial deposits are exposed as bluffs where the Alabama River or its tributaries have eroded into the strata. Rocks of Oligocene age, generally the Marianna Limestone, are at or near the surface over most of the quarry area. Some of the higher areas have a cover of Quaternary high terrace deposits. Alluvial material is found associated with the river and stream floodplains (Scott, 1972).

In Monroe County formations ranging from Holocene to lower Eocene crop out at the surface. The older rocks occur at the surface in the northeastern part of the county and the younger strata in the south. Quaternary alluvial, low terrace, and high terrace sediments occur throughout the county. The outcrop pattern of the rocks is generally dendritic, reflecting the soft nature of the limestones which are being eroded by streams and rivers. The formations and pertinent information are summarized in Table B.G.2.

Specific site geology was studied by Ideal Basic Industries, Inc., during the exploratory phase of the project in 1960 and again in 1970. Test holes were made to determine the thickness of overburden and thickness of mineable stone. The geologic section encountered is shown in Figure B.G.14. Generally the formations encountered range from the Yazoo clay at the base through various Eocene and Oligocene limestones covered by Pliocene or Pleistocene sands and clays and various soil layers.

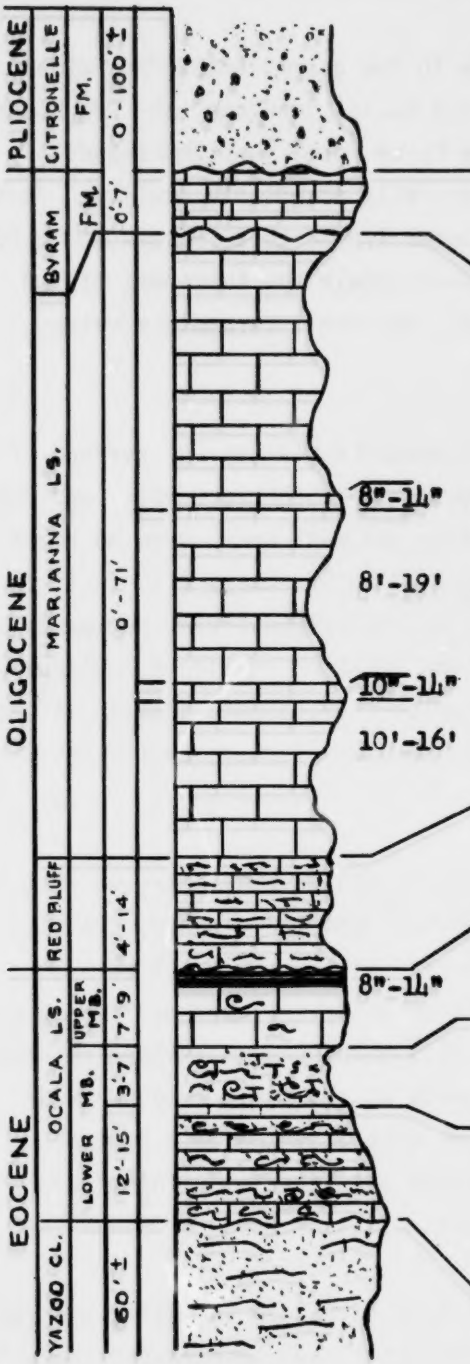
Table B.G.2. Important Formations and their Characteristics, Monroe County, Alabama

ERA	SYSTEM	SERIES	STAGE	FORMATION	LITHOLOGY	THICKNESS (FT.)		AQUIFER CHARACTERISTICS	OTHER CHARACTERISTICS
Cenozoic	Quaternary	Holocene		Alluvium Low terrace deposits	Gravel, sand, silt, clay	10-40		Limited domestic and stock use	
		Pleistocene		High terrace deposits	Gravel, sand, sandy clay	5-50			
	Tertiary	Pliocene		Citronelle Fm.	Gravel, sand, sandy clay	5-50		Supplies water for most farms and a few industries. Water is soft, low in dissolved solids, but may be high in iron. 16-24ppm hardness; 0.23-4.8ppm iron.	
		Miocene		(Undifferentiated)	Sand, gravel, clay, limestone	50-300			
		Oligocene		Chickasawhay Limestone	Limestone	1-25		Probably not used.	This formation is absent on most outcrops.
			Vicksburg	Byram Fm.	Limestone, clay, sandy clay	20-70	100-160	Sufficient for domestic use. Water is hard, alkaline.	The Glendon member consists of 10-20 feet of hard limestone locally called "horsebone" because of its weathering characteristics.
				Marianna Limestone	Limestone	50-80		Sufficient for municipal use. Yields reported as high as 175gpm. Water moderately hard: 83-118 ppm hardness; 92-135 ppm bicarbonate; 0.04-0.46 ppm iron.	
				Red Bluff Clay (limestone facies)	Sandy limestone	5-10		Relatively impermeable, not important as a water supply.	

Table B.G.2. Important Formations and their Characteristics, Monroe County, Alabama (Continued, page 2 of 2)

ERA	SYSTEM	SERIES	STAGE	FORMATION	LITHOLOGY	THICKNESS (FT)		AQUIFER CHARACTERISTICS	OTHER CHARACTERISTICS
Cenozoic	Tertiary	Eocene	Jackson	Ocala Limestone	Limestone sandy limestone	25-75	35-125	Generally not used due to low yield. Hard water, alkaline	Some springs are developed at the contact with the Yazoo Clay.
				Yazoo Clay	Sandy silty clay, silty sand	10-30		Relatively impervious; not used for water supply.	
				Moodys Branch Formation	Sand, sandstone	3-20			
			Claiborne	Lisbon Fm. Gosport Sand	Sand, clay, sandy clay Gravelly sand, sandstone	30-200		Yields reported up to 140 gpm Water quality good, alkaline. .09-1.3 ppm iron; 57-178 ppm bicarbonate; 1.0-9.2 ppm sulphate; 0.2-5.4 ppm nitrate; 3.0-7.1 ppm chloride; 0.1-0.2 ppm fluoride; 61-147 ppm hardness.	
				Tallahatta Fm.	Siltstone, claystone, gravelly sand sandy clay	40-100		Some use made of this source.	
			Wilcox	Hatchetigbee Fm.	Clay, sand, sandstone, lignite	135-275		Not used as a source of water.	
				Tuscahoma Sand	Sand, clay, sandstone	250-275		Best potential for large quantities of water; yields up to 900 gpm reported. High in dissolved solids, bicarbonate. Soft, alkaline. High in fluoride content.	
				Nanafalia Fm.	Sand, sandy clay, siltstone	200-225			

Sources: Ivey, 1957.
Scott, 1972.


PLIOCENE
CITRONELLE FM.
0'-100'±
BYRAM FM.
0'-7'
OLIGOCENE
MARIANNA LS.
0'-71'
RED BLUFF
4'-14'
EOCENE
OCALA LS.
UPPER MB.
7'-9'
LOWER MB.
3'-7'
12'-15'
YAZOO CL.
60'±
8"-14"
8'-19'
10"-14"
10'-16'
8"-14"

Clay. Reddish brown to light gray. Irregularly-bedded sandy clay, sand and gravel.

Ls. Light gray to buff. Very hard and crystalline. Called Horsebone.

Ls. Light cream. Soft, porous, highly fossiliferous.

Ls. White. Dense, very hard.

Ls. Light cream. Soft, porous, fossiliferous.

Ls. White. Dense, very hard.

Ls. Light cream. Soft, porous, fossiliferous.

Argil. Ls. Gray to dark gray. Contains abundant clay, black phosphatic sand, greenish black glauconitic sand.

Ls. Gray to light gray. Top 8"-14" hard, dense, very fossiliferous. Rest soft, fossiliferous.

Coquina. Gray to light gray. Poorly consolidated medium- to coarse-sized quartz sand and shells. Abundant glauconite.

Ls. Buff to gray. Interbedded sandy shell coquina and hard fossiliferous ls. Glauconitic. Abundant medium- to coarse-sized quartz sand. Lower 2'-3' very hard, fossiliferous ls.

Clay. Bluish gray. Micaceous, sandy, thin-bedded.

Figure B.G.14
COLUMNAR SECTION, PROPOSED QUARRY SITE
(Adapted from R.L. Stienmier, 1970)

SOURCE: Environmental Science and Engineering, Inc., 1977.

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The formations of economic importance in the quarry area, from oldest to youngest, are: the upper member of the Ocala Limestone, the Red Bluff Clay, the Marianna Limestone, and the Byram Formation ("horsebone"). These make up the limestones of commercially acceptable quality. Their total thickness in the quarry area ranges from 0 to 28 meters (0 to 95 feet). Apparently 28 meters (95 feet) is approximately the thickness of the complete section (Ocala through Byram), and the intermediate values represent various degrees of erosion.

Citronelle Formation and high terrace deposits blanket the surface of the underlying limestone. It is composed of sand, clay, soil, and other materials which are uneconomical to mine and must be removed to reach the limestone. The thickness varies from 0 to 33 meters (110 feet) in the quarry area. The overburden is thick in the upland areas, decreases in the lower areas, and becomes thin or non-existent on slopes. Stienmier (1970) places the Citronelle at the top of the geologic section at the quarry; however, Scott (1972) does not show any surface expression of Citronelle in the area.

The soils at the quarry site are primarily upland soils derived from lime-bearing rocks and from unconsolidated deposits of sand, gravels, and clays. The soils are generally acidic with a pH of 4.5 to 5.5 (Hyde, 1970). An east-west cross section of several boring logs at the site is presented in Figure B.G.15. This shows the soil/slope relationships which occur in the area. The sandy upland soils tend to grade into sandy clays along the lower slopes with clay and silt content increasing toward the river level. Along the streams draining the property are primarily sands and gravels.

In areas where the vegetation has not been disturbed the soils are relatively stable; on steep slopes in areas which have been logged there is evidence of erosion.

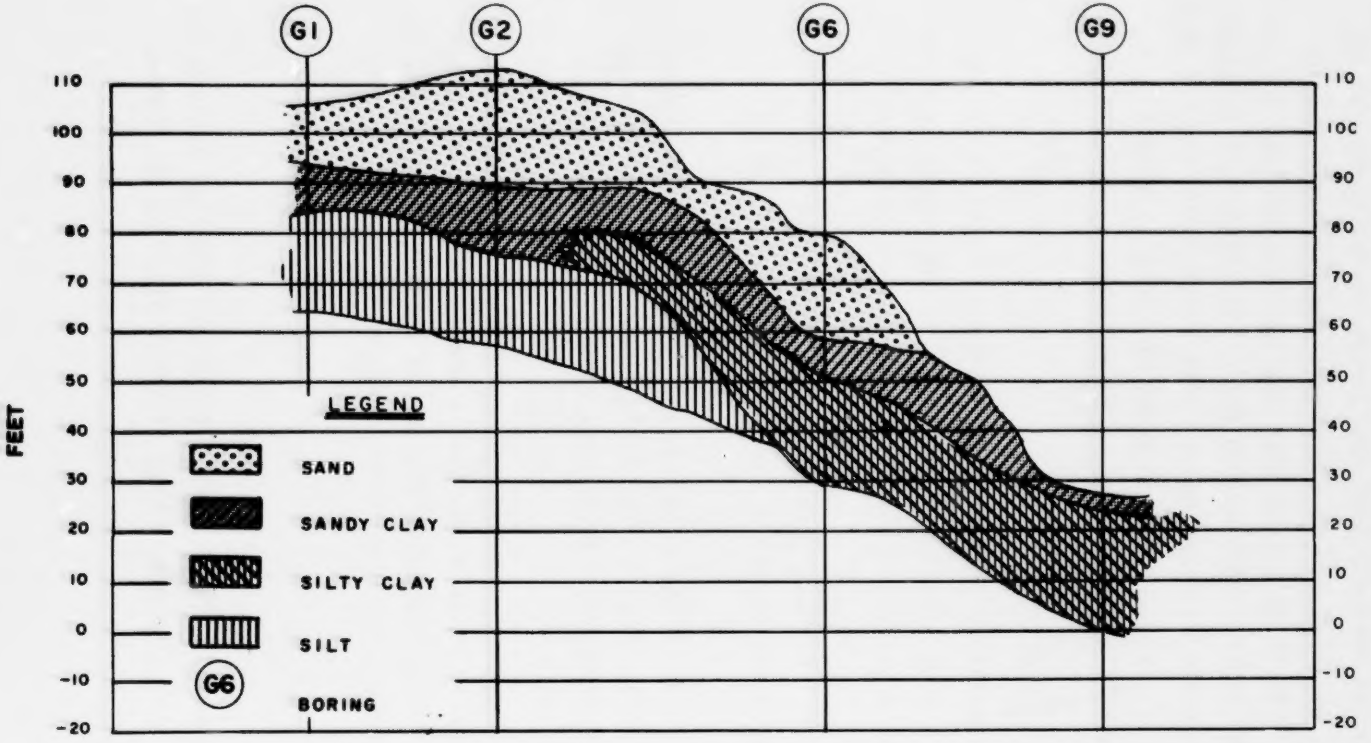

Figure B.G.15
SUBSURFACE PROFILE

NOTE:
DATA CONCERNING THE VARIOUS STRATA HAVE BEEN OBTAINED AT BOREHOLE LOCATIONS ONLY THE SOIL BETWEEN BOREHOLES HAS BEEN INFERRED AND SO MAY VARY FROM THAT SHOWN.

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SOURCE: Palmer and Baker Engineers, Inc., 1975.

STRUCTURE

Data from the test holes indicate that the strata strike northwest and dip to the southwest at about 5.4 to 7.2 meters per kilometer (30 to 40 feet per mile). This is in accord with the regional geology for the area. The top of the lower member of the Ocala Limestone (the proposed base of the quarry) on the Gaillard quarry site ranges from greater than 22 meters (75 feet) msl in the northern areas to about 13 meters (45 feet) in the south. The normal (mean) river stage is about 3 meters (10 feet) msl.

Faulting has been detected by boreholes in Sections 22 and 27 of Township 6N, Range 5E. A minor fault was uncovered in the southwest corner of Section 22, Township 6N, Range 5E, in a road cut. Displacement of strata was about 1 to 2 meters (3 to 6 feet). The strike of the fault was east, with the fault plane dipping north and being upthrown on the north side. No surface expression was evident (Stienmier, 1971).

Several closed depressions which occur on the property may be sinkholes. Because of the limestone rocks and the humid climate, a certain amount of solutioning can be expected. Voids were commonly encountered in drilling (Stienmier, 1971).

Thompson Mill Creek (also known as Marshalls Creek) exhibits an abrupt change in direction in the southeast quarter of Section 15 which may be an expression of an underlying structural feature.

GROUND WATER

In the Monroe County area, both the water table and artesian systems are used for water supplies. The properties of these aquifers are summarized in Table B.G.2.

The quarry will cut into two formations of local importance as aquifers, the Citronelle and the Marianna, as well as several units of minor importance.

Because of river and stream erosion which has cut through all of the limestone units above the Yazoo Clay (Ocala, Red Bluff, Marianna, and Byram) and because of the relatively high permeability of the limestones from solution channeling, it is expected that the water level will be near or at the top of the Yazoo Clay (an impermeable layer) for some distance from the river. There is active discharge into the creeks and river (see Figure B.G.16).

The Citronelle has a relatively low permeability and is discontinuous. Discharge from the Citronelle should create no problems to quarry operations, nor should the quarry affect water levels in the Citronelle except to a local extent.

Several aquifer systems of importance underlie the Yazoo Clay at the quarry site. The Eocene aquifers are discussed in Table B.G.2. Aquifers in pre-Eocene rocks, which have potential for development as groundwater supplies, include the Tuscaloosa Group and the Eutaw and Ripley Formations (Upper Cretaceous).

Groundwater quality is generally soft in the sand aquifers but may be high in iron. Limestone formations yield larger quantities of water but are typically moderately hard to hard. Chlorides are low throughout the area. Water quality is summarized in Table B.G.2.

A partial inventory of wells in the vicinity of the quarry site is given in Table B.G.3 and their locations are shown in Figure B.G.17. All these wells are along the eastern boundary of the property. The determination of the formations from which these wells obtain water is based on the depth of the well below the surface and the known elevations of geologic formations in the area.

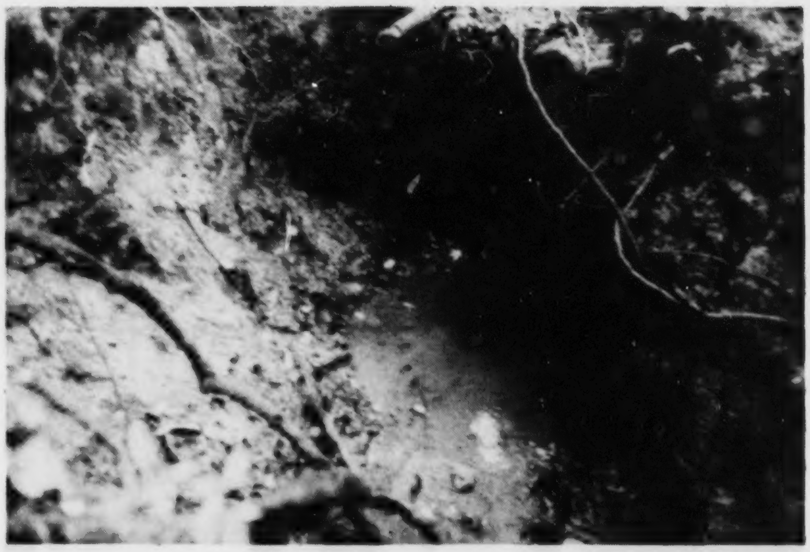

Figure B.G.16
SPRING DISCHARGING AT THE UPPER CONTACT OF THE YAZOO FORMATION ALONG MARSHALLS BLUFF

SOURCE: Environmental Science and Engineering, Inc., 1977.

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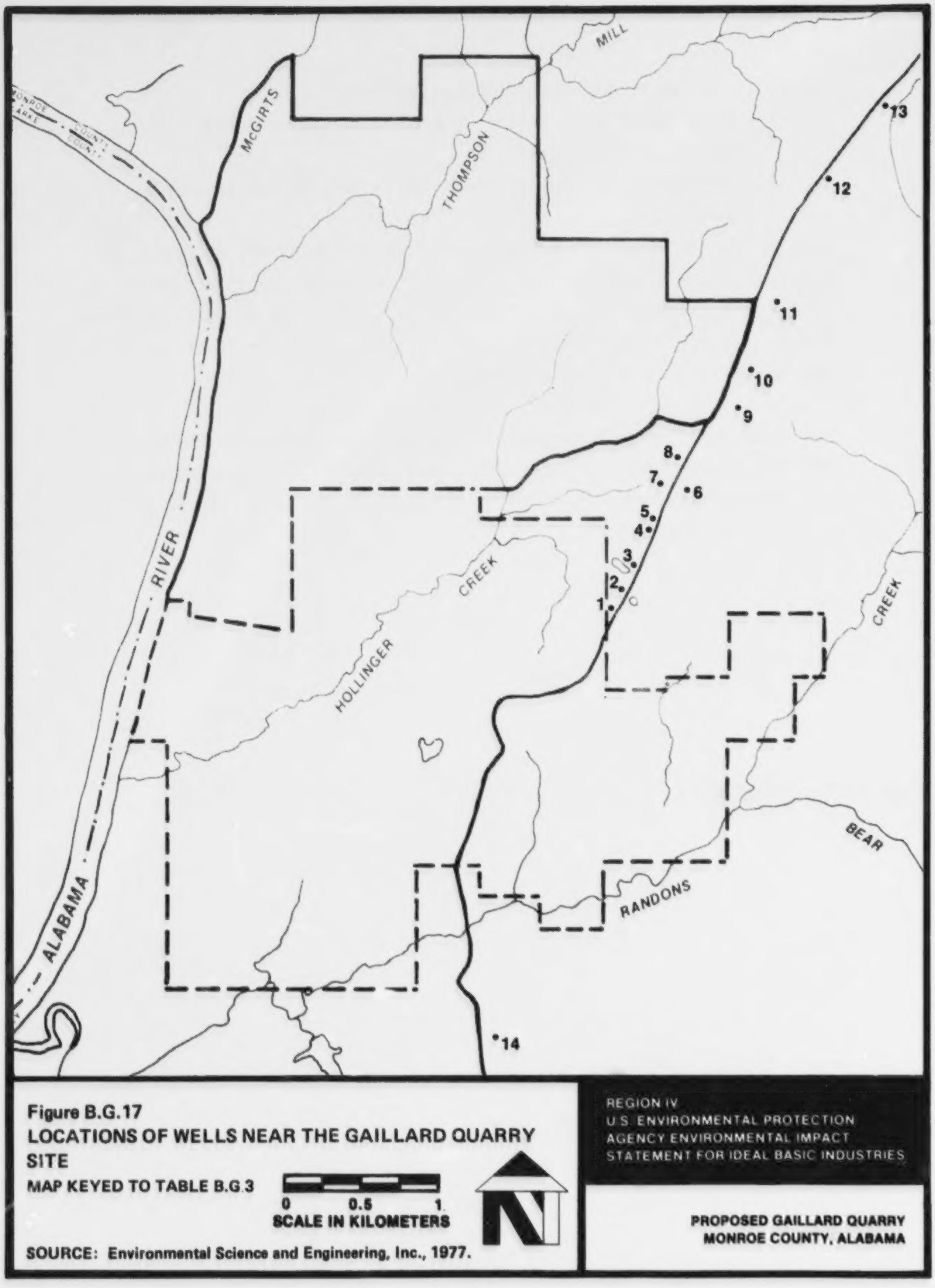
Table B.G.3. Partial Well Inventory for Wells Near Gaillard Quarry Site (see Figure B.G.17)

Well No.	Location	Depth (ft.)	Diameter	Land Surface Elevation (ft. msl)	Probable Aquifer
1	SW 1/4, SE 1/4, NE 1/4, Sec. 26, T6N, R5E	210	2"	165	Lisbon Formation--Gosport Sand, below Yazoo Clay
2	SW 1/4, SE 1/4, NE 1/4, Sec. 26, T6N, R5E	138	2"	160	Lisbon Formation--Gosport Sand, below Yazoo Clay
3	NW 1/4, SE 1/4, NE 1/4, Sec. 26, T6N, R5E	--	--	155	--
4	SE 1/4, NE 1/4, Ne 1/4, Sec. 26, T6N, R5E	250	2"	157	Lisbon Formation--Gosport Sand, below Yazoo Clay
6	SW 1/4, SW 1/4, SW 1/4, Sec. 24, T6N, R5E	--	--	157	--
7	SE 1/4, SE 1/4, SE 1/4, Sec. 23, T6N, R5E	158	2"	150	Lisbon Formation--Gosport Sand, below Yazoo Clay
8	NW 1/4, SW 1/4, SW 1/4, Sec. 24, T6N, R5E	--	--	150	--
9	SW 1/4, NE 1/4, SW 1/4, Sec. 24, T6N, R5E	180	4"	165	Lisbon Formation--Gosport Sand, below Yazoo Clay
10	NW 1/4, NE 1/4, SW 1/4, Sec. 24, T6N, R5E	40-50	--	112	Water table aquifer--Pliocene/Pleistocene sand
11	NE 1/4, SE 1/4, NW 1/4, Sec. 24, T6N, R5E	30	36"	250	Water table aquifer--Pliocene/Pleistocene sand

Table B.G.3. Partial Well Inventory for Wells Near Gaillard Quarry Site (Continued, page 2 of 2)

Well No.	Location	Depth (ft.)	Diameter	Land Surface Elevation (ft. msl)	Probable Aquifer
12	SE 1/4, NW 1/4, SE 1/4, Sec. 13, T6N, R5E	38	--	245	Water table aquifer--Pliocene/ Pleistocene sand
13	SE 1/4, SE 1/4, NE 1/4, Sec. 13, T6N, R5E	--	36"	210	Water table aquifer--Pliocene/ Pleistocene sand
14	SE 1/4, NE 1/4, NW 1/4, Sec. 2, T5N, R5E	--	--	165	--

Source: Environmental Science and Engineering, Inc., 1977.



MONROE COUNTY
CLARKE COUNTY
McGIRTS
THOMPSON
MILL
ALABAMA
RIVER
HOLLINGER
CREEK
CREEK
BEAR
RANDONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
0
0.5
1
SCALE IN KILOMETERS
N

Figure B.G.17
LOCATIONS OF WELLS NEAR THE GAILLARD QUARRY SITE
MAP KEYED TO TABLE B.G.3

SOURCE: Environmental Science and Engineering, Inc., 1977.

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The wells for which the depth is known are either:

1. Water table wells obtaining water from the surficial sands (Pliocene/Pleistocene); or
2. Artesian wells tapping the Lisbon Formation and/or Gosport Sand.

None of the wells obtains water from the Byram, Marianna, or Ocala. Solution channels encountered in drilling at the quarry site suggest that a high permeability may exist; the formations may dewater, at least during part of the year, by discharge to streams and the river and thus may be undesirable as a water source.

The water level in well number 9 is reported to be about 12 meters (40 feet) below land surface. This level suggests that the aquifers confined by the Yazoo Clay flow at land surface elevations below 42 meters (140 feet) msl.

APPENDIX B. BASELINE
WATER RESOURCES

PLANT SITE
EXISTING ENVIRONMENT (1977)
General Overview of Mobile Bay
Physiography

Mobile Bay, the northernmost estuary of the Gulf of Mexico, measures 50 kilometers (31 miles) north to south and has an average width of 17.4 kilometers (10.8 miles) (Tanner, et al.). Northerly and southerly winds act upon this 50-kilometer (31-mile) fetch of open water to cause significant local variations in astronomical tidal elevations. Mobile Bay and the Mobile River delta cover approximately 1,200 square kilometers (470 square miles) and have an average depth of 3 meters (10 feet) of water (U.S. Army Corps of Engineers, Mobile District, 1977). Of the total area, about 2 percent is tidal marsh, 4 percent "lakes," 5 percent rivers, bayous, and connecting bays; and approximately 89 percent is open water (Crance, 1971). These values are variable as a result of alluvial deposition, accretion of marine sediments along the southern boundary, wind erosion of the shorelines, production and deposition of biogenous materials, and eustatic sea level fluctuations.

Hydrodynamic Processes

Natural and man-made channels, depositional areas, and disposal areas for dredge spoil divide the bay physiographically. As a result of delta formation in the northern bay, the east and west sides have gently curving steep-sloped shorelines. These shorelines are continuations of the uplands. The southern shoreline and tidal inlet are areas of longshore deposition which have narrowed the seaward opening of the estuary and have created the Mississippi Sound-Mobile Bay system. The accretion of 4.2 million metric tons (4.6 million tons) per year of suspended sediments entering the bay from the Mobile River system (U.S. Army Corps of Engineers, Mobile District, 1977) builds up the northern shore. Deposition exceeds subsidence in this region. As suspended particles enter the bay from the river system, changes in water currents and salinities cause them to flocculate and precipitate. The interior bay sediments thereby become enriched in clays and silts while coarser materials encircle the nearshore areas (U.S. Army Corps of Engineers, Mobile District, 1977). Bay sediments are primarily alluvial (deposited by rivers and streams), biogenic (produced by organisms), or allochemical (produced _in situ_ by chemical reactions), or of marine origin.

The geometry of the bay is the primary determinant of the hydrodynamic processes active in Mobile Bay. The 50-kilometer (31-mile) fetch is a significant feature responsible for partial control of water surface elevations. The complex bay bottom, formed by the delta, longshore deposition, causeways (landfills), and man-made channels, disrupts and slows circulation of bottom waters while surface waters move in response to winds, tides, and freshwater inflow (U.S. Army Corps of Engineers, Mobile District, 1977).

Mobile Bay has a diurnal tide which varies in range from 36 centimeters (1.2 feet) at the bay entrance to 45 centimeters (1.5 feet) at the head. The weighted mean tide range of 42 centimeters (1.4 feet) over the surface area of the bay creates a tidal prism of 411,000,000 cubic meters (333,000 acre-feet) (U.S. Army Corps of Engineers, Mobile District, 1977).

Water Quality

The complex hydrodynamic processes at work in Mobile Bay result in highly variable water quality throughout the system. In general, salinities range from 5 to 15 parts per thousand and the turbidity is greater than 10 Jackson Turbidity Units (JTU) during the winter and spring periods of high freshwater inflow. During summer and fall periods of low inflow from tributaries, salinities are higher (10 to 30 parts per thousand) and turbidities lower (less than 10 JTU) (U.S. Army Corps of Engineers, Mobile District, 1977).

A saltwater wedge and the associated chemical and physical gradients are present throughout the bay and lower Mobile River. Vertical stratification of the water column is most pronounced during the summer period when freshwater inflow is low and winds are calm (SARPC, 1976). Tidal mixing processes alone are not strong enough to prevent formation of stable density stratification caused by the combined effects of salinity and temperature gradients. This stable density structure prevents re-aeration of bottom waters. Consequently, normal respiration of benthic organisms and biochemical oxygen demand of suspended and dissolved organics often results in severe oxygen depression.

Extensive fish kills can occur during the summer. They are locally known as "jubilees" and were observed as early as the 1860's. The kills are explained as resulting from a complex interaction of offshore winds and rising tides which displace oxygen-deficient waters from deep areas into shallow areas (U.S. Army Corps of Engineers, Mobile District, 1977; SARPC, 1976). Epifaunal organisms may also be killed by the oxygen deficiency.

Contamination by fecal bacteria is a serious problem throughout the system and has resulted in the closure of large areas to shellfish harvesting. Other water quality problems are being investigated by the Mobile-Baldwin 208 study (SARPC, 1977) to identify point sources of pollution (industrial and municipal), nonpoint cultural pollution sources (agricultural runoff, urban runoff, industrial site runoff, and hydrographic modifications), and natural pollution sources (river inflow of nutrients and organics, and turbidity; salinity stratification and stagnation; temperature shock) and relate them to observed receiving water quality (see Table B.W.1).

Theodore Barge Canal and North Fork Deer River

The proposed plant site of Ideal Basic Industries is situated on the Theodore Barge Canal, an appendage of Mobile Bay. The existing canal is

Table B.W.1. Historical Water Quality Data, 1976

STATION: 21
PERIOD OF RECORD: April-October, 1976
LONG: LAT: T: R: SECTION:
LOCATION: Mouth of Theodore Ship Channel (Deer River)

COUNTY: Mobile
MONITORING SEGMENT:
STREAM CLASSIFICATION: Fish and Wildlife

	WEATHER DATA				PHYSICAL DATA												
								Water Temperature °C			Dissolved Oxygen			Specific Conductance umho/cm		
DATE/TIME	Wind Speed MPH	Wind Direc-tion	°C Air Temp.	Cloud Cover	Water Depth (Ft.)	Sample Depth (Ft)	PH	1'	5'	1'OB	1'	5'	1'OB	1'	5'	1'OB
4-8-76/1510	10	NNE	28	Partly Cloudy	14.5	5	-	-	21	-	-	7.0	-	-	-	-
4-20-76/1540	9	S	28	Clear	12	5	-	26.3	24	23.5	6.9	4.9	3.8	-	-	-
5-13-76/1430	25	S	28	Cloudy	13	5	-	26	25.5	25	6.4	6.1	5.2	-	-	-
7-15-76/1230	Calm	-	33	Clear	11.5	5	7.2	31.5	30	29.1	5.3	4.8	1.3	-	-	-
10-22-76/1150	16	NE	21	Clear	13	5	7.6	18.5	18	18	7.4	7.9	7.4	-	-	-

	CHEMICAL DATA (All units are mg/l except as noted)												
DATE/TIME	BOD_5	NO_2N	NO_3N	NH_3N	Org N-N	PO_4P	TDS	O & G	Hg	Zn	Pb	Fec. Col. #/100ml	Chl "a"
4-8-76/1510	1.9	0.16	0.008	0.035	0.24	0.046	328	<1	-	0.014	<0.01	61	1
4-20-76/1540	2.2	0.12	0.010	0.027	0.49	0.093	399	<1	-	0.016	<0.01	83	13
5-13-76/1430	2.5	0.03	<0.005	0.040	0.21	0.082	3,520	<1	-	0.012	<0.01	51	6
7-15-76/1230	2.6	0.02	0.005	0.090	0.36	0.036	5,340	-	<.0002	0.018	-	37	5.
10-22-76/1150	1.6	0.02	<0.005	0.090	0.50	0.042	13,200	<1	<.0002	0.027	<0.01	15	5.

Source: SARPC, 1976.

approximately 3.2 kilometers (2 miles) long, 60 meters (200 feet) wide, and about 4 meters (12 feet) deep. Before being dredged in 1968, the canal was a portion of the Middle Deer River streambed. The part of the Middle Deer River that has not been dredged is a marshy bayou which meanders in a northerly direction away from the Theodore Barge Canal for about 2 kilometers (1.2 miles) (Swingle and Bland, 1974). Traversing the Ideal Basic Industries property and emptying into the canal is the North Fork Deer River, a small tidal creek. North Fork Deer River has an estimated net flow of 5.7 to 28 liters per second (0.2 to 1.0 cfs) (SARPC, 1976) and an average width of about 6 meters (20 feet) as it crosses the property. The North Fork maintains its flow from precipitation [1,702 millimeters per year (67 inches per year)] and groundwater seepage (SARPC, 1974). The Theodore Barge Canal drains an area of over 1,400 hectares (3,500 acres) (SARPC, 1976).

The existing barge canal has a trapezoidal cross-section with approximate side slopes of 3:1. It maintains this geometry into the Mobile Bay as the Hollingers Island Channel. The canal has a mean tide of 45 centimeters (1.5 feet), little freshwater inflow, and is oriented perpendicular to the predominant wind direction (Swingle and Bland, 1974). These physical features result in limited circulation and stagnant bottom waters during most of the year.

Water samples were collected at three barge canal stations and at two stations on the North Fork Deer River (Environmental Science and Engineering, Inc., 1977). The locations of these stations are shown in Figure B.W.1, and the water quality data are presented in Table B.W.2.

The Mobile 208 study (SARPC, 1976; see Table B.W.1), as well as recent chemical data (Environmental Science and Engineering, Inc., 1977; see Table B.W.2 and Figure B.W.2), documents a vertical dissolved oxygen gradient in both the canal and the bay in fall and summer. The sharp dissolved oxygen gradient (saturated at the surface, zero near the bottom) exists when there is an attendant salinity gradient (Figures B.W.2 and B.W.3). This dissolved oxygen stratification is a

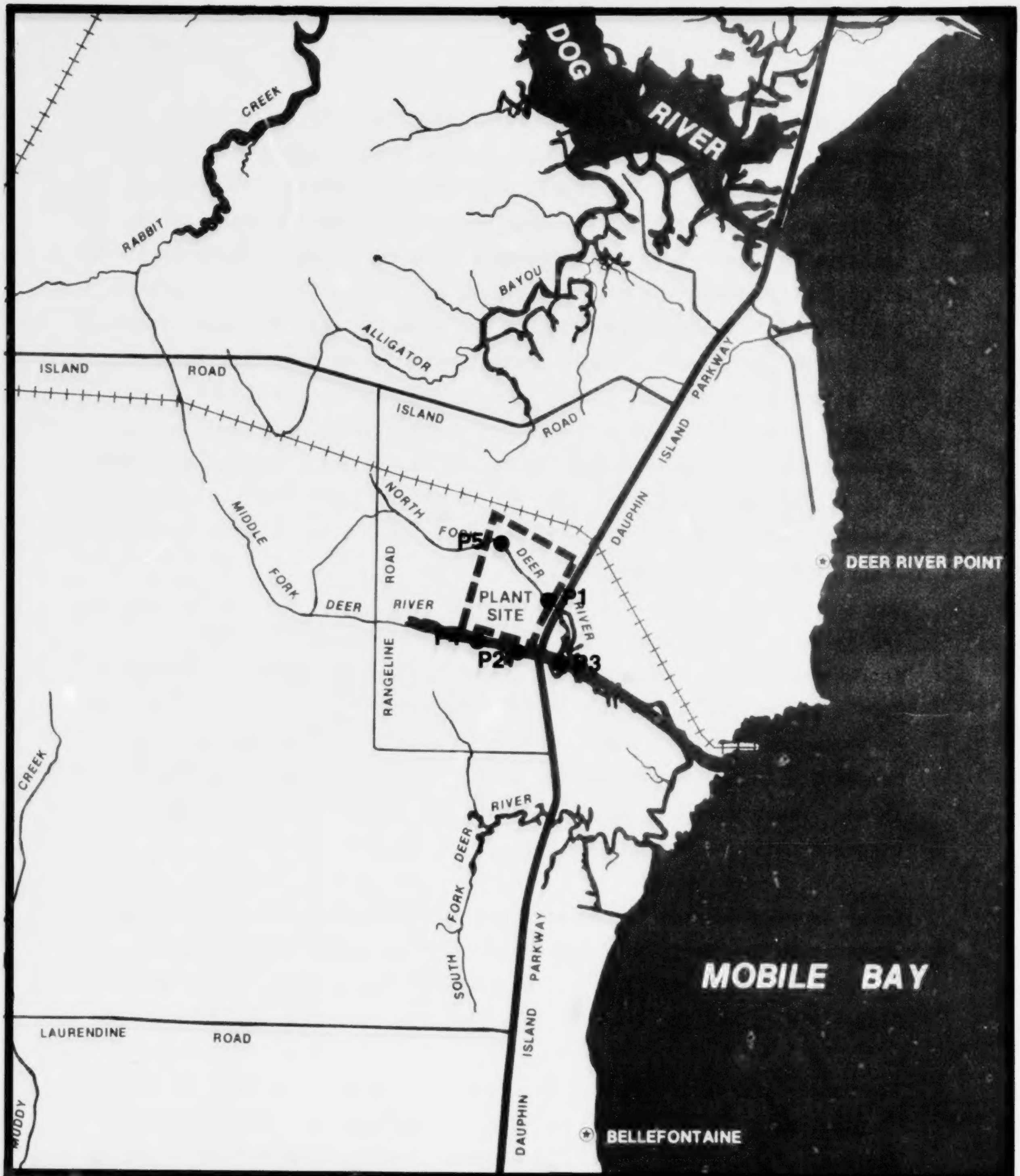
DOG RIVER
RABBIT CREEK
BAYOU
ALLIGATOR
ISLAND ROAD
ISLAND ROAD
DAUPHIN ISLAND PARKWAY
NORTH FORK
DEER RIVER
MIDDLE FORK DEER RIVER
RANGELINE ROAD
P5
PLANT SITE
P1
P4
P2
P3
DEER RIVER POINT
CREEK
SOUTH FORK DEER RIVER
DAUPHIN ISLAND PARKWAY
MOBILE BAY
LAURENDINE ROAD
MUDDY
BELLEFONTAINE

Figure B.W.1
WATER SAMPLING STATION

0 0.5 1
SCALE IN KILOMETERS
N

SOURCE: Environmental Science and Engineering, Inc., 1977.

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PROPOSED CEMENT MANUFACTURING
PLANT THEODORE INDUSTRIAL PARK
MOBILE, ALABAMA

Table B.W.2. Water Quality of Theodore Industrial Park Area (Station P1, Lower North Fork Deer River)

Parameters Date Time	Storet No.	4/20 10:30	5/17 12:45	5/31 13:45	6/15 12:45	6/30 12:20	7/12 11:35	7/28 13:20	8/9 09:30
T-PO_4 (mgP/l)	00665	.14	.08	<.02	.12	.05	0.17	0.20	0.04
O-PO_4 (mgP/l)	00671	.005	<.002	<.002	.006	<.002	0.005	0.010	<0.002
TKN (mgN/l)	00625	1.28	1.22	1.30	1.30	0.79	1.9	1.9	1.6
NH_3 (mgN/l)	00610	.05	.08	.14	.05	<.03	0.25	0.10	0.12
NO_2-NO_3 (mgN/l)	00630	.17	.007	.084	.051	<.004	0.057	0.051	0.033
BOD_5 (mg/l)	00310	3.6	2.8	2.4	2.4	3.1	3.0	2.4	3.4
TOC (mg/l)	00680	12	4.8	<1.0	<1.0	6.8	8.4	10.0	10.0
Temp (°C)	00010	25.0	28.0	32.0	32.8	31.0	29.3	31.0	31.0
Sp. Cond. (umhos/cm)	00094	1,120	8,900	8,800	16,490	16,300	15,500	19,800	10,350
TS (mg/l)	00500	700	5,400	4,780	11,400	10,600	10,800	12,800	6,080
TDS (mg/l)	70300	686	5,390	14,764	11,385	10,579	10,800	12,800	6,060
SS (mg/l)	00530	14	10	16	15	21	22	24	17
Turbidity (NTU)	00076	18	5.2	6.6	5.3	5.3	8.5	7.2	7.7
Color (CPU)	00080	50	35	25	15	5	15	25	25
Hardness (mg/l @ $CaCO_3$)	00900	125	937	868	1,870	1,720	1,710	2,220	1,100
Alkalinity (mg/l @ $CaCO_3$)	00410	27.8	50.0	45.0	19.0	27.4	42	45	38
pH	00400	6.9	7.3	7.3	6.8	7.3	6.5	6.6	7.2
DO (mg/l)	00299	7.8	7.2	4.5	5.3	6.4	3.0	5.0	4.4
DO (% sat.)	00301	93	99	61	75	89	41	70	60
Fecal Col. (#/100 ml)	31616	1,100	100	810	24	--	230	600	170
Fecal Strep. (#/100 ml)	31679	230	208	625	3,500	920	590	1,400	73
FC/FS	---	4.8	.48	1.3	.01	--	0.39	0.43	2.33
Cl^-	00940	--	--	2,510	5,540	5,130	4,960	6,490	3,090
$SO_4^=$	00945	--	334	227	828	771	679	832	425
Chlor. a (mg/m^3)		--	--	12.1	7.44	25.4	10.2	7.49	29.6
Iron (ug/l)	01045	--	--	433	341	151	347	752	419
Lead (ug/l)	01051	<3.0	--	24	<3.0	<3.0	<3.0	5.0	<3.0
Mercury (ug/l)	71900	1.1	0.67	4.1	3.0	<0.08	0.49	<0.08	<0.08

Table B.W.2. Water Quality of Theodore Industrial Park Area (Station P2, Barge Canal, East Property Boundary) (Continued, page 2 of 5)

Parameters Date Time	Storet No.	4/20 11:15	5/17 12:00	5/31 12:37	6/15 12:00	6/30 11:00	7/12 09:15	7/28 11:30	8/9 07:45
T-PO_4 (mgP/l)	00665	.10	.13	.08	.18	.04	0.24	0.17	0.028
O-PO_4 (mgP/l)	00671	.006	.004	<.002	.006	<.002	0.019	0.020	<0.002
TKN (mgN/l)	00625	.82	1.20	1.10	0.89	1.0	1.9	2.1	1.5
NH_3 (mgN/l)	00610	.07	.12	.11	<.03	.04	0.02	0.04	0.16
NO_2-NO_3 (mgN/l)	00630	.17	.018	.006	.016	<.004	<0.004	<0.004	0.040
BOD_5 (mg/l)	00310	1.8	2.5	1.6	4.9	2.7	8.1	7.0	4.0
TOC (mg/l)	00680	9.8	2.9	<1.0	2.5	7.2	8.8	8.3	4.5
Temp (°C)	00010	24.0	26.9	29.0	31.0	30.8	29.0	31.4	31.0
Sp. Cond. (umhos/cm)	00094	880	9,310	9,810	17,200	15,300	16,700	19,400	10,620
TS (mg/l)	00500	700	6,070	8,180	11,500	10,220	11,000	12,800	6,200
TDS (mg/l)	70300	694	6,061	8,172	11,483	10,184	11,000	12,800	6,190
SS (mg/l)	00530	6.0	9.0	8.0	17	16	25	14	6
Turbidity (NTU)	00076	16	4.4	3.9	5.7	4.1	8.7	6.2	4.4
Color (CPU)	00080	30	23	15	10	15	10.	15	20
Hardness (mg/l @ $CaCO_3$)	00900	124	1,030	1,430	1,900	1,680	1,780	2,240	1,150
Alkalinity (mg/l @ $CaCO_3$)	00410	27.1	54.0	34.0	67.0	30.0	43	44	39
pH	00400	6.8	7.4	6.6	7.0	6.9	6.6	7.0	7.0
DO (mg/l)	00299	7.3	9.5	7.0	10.9	7.6	1.0	6.3	5.1
DO (% sat.)	00301	86	81	90	151	104	14	89	70
Fecal Col. (#/100 ml)	31616	440	52	160	2	--	560	<100	25
Fecal Strep. (#/100 ml)	31679	48	38	86	70	20	170	6	12
FC/FS	---	9.2	1.37	1.86	.03	--	3.29	--	2.08
Cl^-	00940	--	--	4,350	5,680	5,050	5,290	6,560	3,220
$SO_4^=$	00945	--	254	417	792	709	709	863	459
Chlor. a (mg/m^3)		--	--	16.2	13.1	25.6	14.6	42.4	18.4
Iron (ug/l)	01045	--	--	252	189	189	194	219	219
Lead (ug/l)	01051	<3.0	--	<3.0	<3.0	3.8	<3.0	<3.0	<3.0
Mercury (ug/l)	71900	0.3	6.8	3.5	4.5	<0.08	<0.08	<0.08	<0.08

Table B.W.2. Water Quality of Theodore Industrial Park Area (Station P3, Barge Canal at Mouth of North Fork Deer River) (Continued, page 3 of 5)

Parameters Date Time	Storet No.	4/20 11:45	5/17 11:40	5/31 12:05	6/15 11:45	6/30 11:52	7/12 09:50	7/28 12:40	8/9 09:00
T-PO_4 (mgP/l)	00665	.10	.10	<.02	.21	.03	0.32	0.17	0.047
O-PO_4 (mgP/l)	00671	.007	<.002	<.002	.008	<.002	0.031	0.014	0.004
TKN (mgN/l)	00625	.84	1.29	0.90	0.96	0.71	2.2	2.2	2.0
NH_3 (mgN/l)	00610	.08	.09	.14	<.03	.07	0.04	0.04	0.12
NO_2-NO_3 (mgN/l)	00630	.17	.082	<.004	.120	<.004	<0.004	<0.004	0.022
BOD_5 (mg/l)	00310	1.8	2.5	2.5	4.1	1.9	8.2	8.3	4.4
TOC (mg/l)	00680	8.6	5.3	<1.0	<1.0	7.2	8.6	8.5	5.6
Temp (°C)	00010	24.0	26.8	26.3	31.0	30.6	29.0	31.0	31.0
Sp. Cond. (umhos/cm)	00094	945	8,830	9,940	17,000	14,400	16,600	19,800	10,620
TS (mg/l)	00500	680	7,280	8,560	11,700	10,200	11,200	12,900	6,300
TDS (mg/l)	70300	670	1,268	8,550	11,700	10,184	11,200	12,900	6,290
SS (mg/l)	00530	10	12	10	--	16	19	11	7.2
Turbidity (NTU)	00076	17	4.7	3.9	6.2	4.2	7.2	7.2	5.1
Color (CPU)	00080	30	20	15	15	10	15	15	20
Hardness (mg/l @ $CaCO_3$)	00900	120	1,200	1,490	1,910	1,580	1,760	2,220	1,130
Alkalinity (mg/l @ $CaCO_3$)	00410	25.6	52.0	34.0	62.0	24.2	44	45	35
pH	00400	6.7	7.4	6.6	7.0	7.0	6.3	7.1	7.4
DO (mg/l)	00299	7.4	9.0	7.7	11.5	7.5	2.5	7.7	6.0
DO (% sat.)	00301	87	86	94	160	100	34	108	82
Fecal Col. (#/100 ml)	31616	1,100	10	34	22	36	7,900	27	8
Fecal Strep. (#/100 ml)	31679	88	6	120	110	31	82	42	7
FC/FS	---	12.5	1.67	.28	.20	1.16	96.3	0.64	1.14
Cl^-	00940	--	--	4,350	2,890	4,840	5,410	6,510	3,270
$SO_4^=$	00945	--	345	408	792	679	740	863	492
Chlor. a (mg/m^3)		--	--	11.3	17.0	32.6	30.2	31.6	25.4
Iron (ug/l)	01045	--	--	324	189	227	271	286	219
Lead (ug/l)	01051	<3.0	--	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Mercury (ug/l)	71900	0.23	0.78	5.0	4.3	<0.08	0.15	<0.08	<0.08

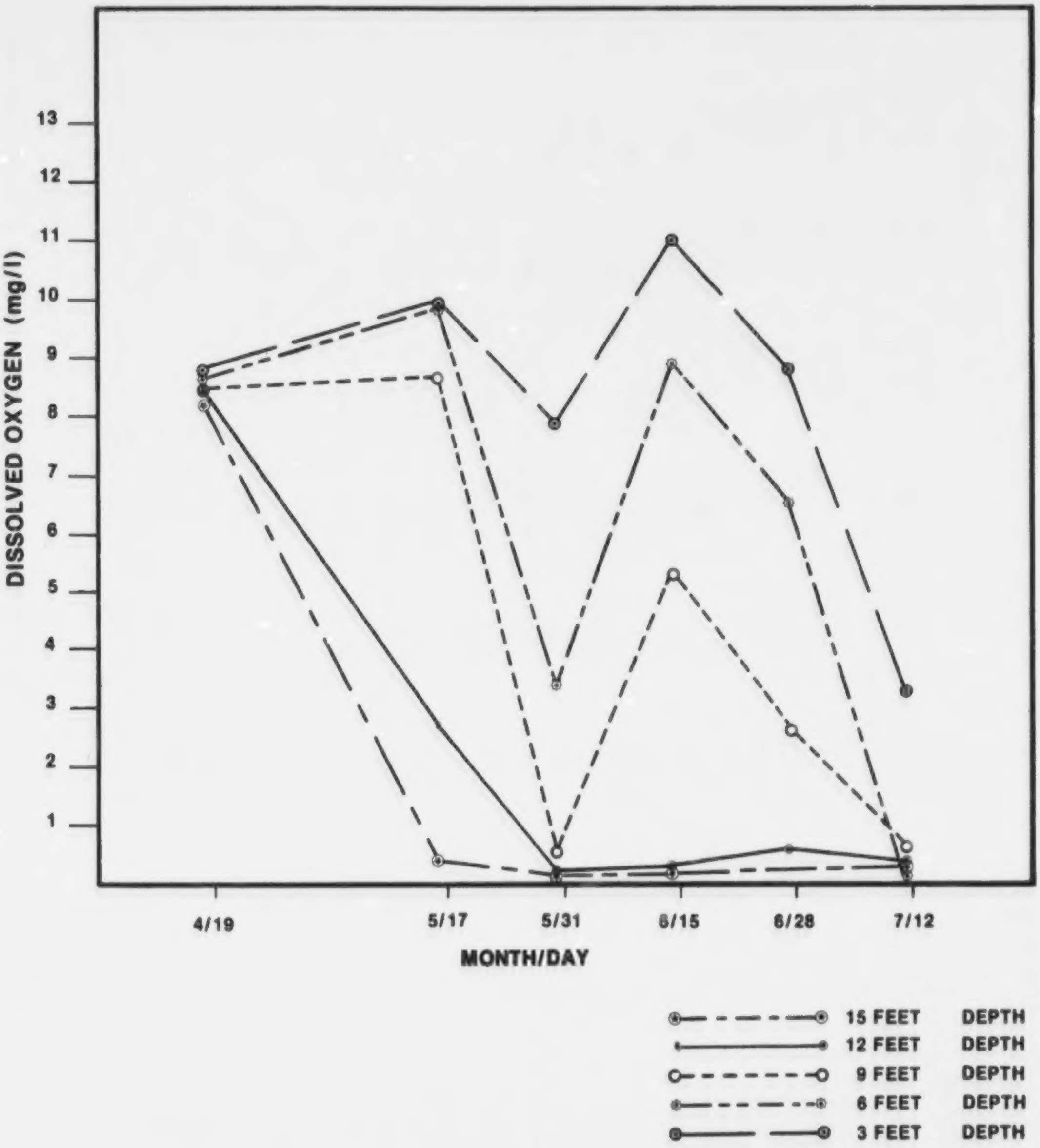
Table B.W.2. Water Quality of Theodore Industrial Park Area (Station P4, Barge Canal West Property Boundary) (Continued, page 4 of 5)

Parameters Date Time	Storet No.	4/20 12:15	5/17 12:10	5/31 12:55	6/15 12:15	6/30 11:25	7/12 10:20	7/28 12:00	8/9 08:20
T-PO_4 (mgP/l)	00665	.08	.10	<.02	.23	.02	0.20	0.15	0.08
O-PO_4 (mgP/l)	00671	.003	<.002	<.002	.006	<.002	0.004	--	0.006
TKN (mgN/l)	00625	.86	1.29	0.82	1.1	0.91	2.2	4.0	1.7
NH_3 (mgN/l)	00610	.09	.11	.15	<.03	.08	0.05	0.03	0.11
NO_2-NO_3 (mgN/l)	00630	.18	.028	.004	<.004	<.004	<0.004	0.017	0.015
BOD_5 (mg/l)	00310	<1.0	2.8	1.2	4.7	1.1	7.5	7.0	6.3
TOC (mg/l)	00680	10	2.5	<1.0	2.5	6.3	9.6	5.9	6.1
Temp (°C)	00010	24.5	26.5	27.2	31.2	31.0	29.0	31.5	31.0
Sp. Cond. (umhos/cm)	00094	930	9,120	9,720	16,900	15,800	17,500	17.600	10,530
TS (mg/l)	00500	706	5,800	8,110	11,700	10,600	12,500	13,000	6,100
TDS (mg/l)	70300	694	5,790	8,103.6	11,687	10,585	12,500	13,000	6,090
SS (mg/l)	00530	12	10	6.4	13	14	22	14	9
Turbidity (NTU)	00076	15	4.3	2.8	5.8	4.1	9.8	7.0	4.8
Color (CPU)	00080	30	20	15	10	10	10	15	20
Hardness (mg/l @ $CaCO_3$)	00900	124	980	1,390	1,920	1,420	1,860	2,260	1,100
Alkalinity (mg/l @ $CaCO_3$)	00410	28.0	46.0	35.0	--	63.2	34	44	36
pH	00400	6.7	7.6	6.5	6.9	6.9	6.6	6.8	7.1
DO (mg/l)	00299	7.8	10.9	8.7	10.7	7.3	6.1	6.6	4.4
DO (% sat.)	00301	92	71	107	149	101	82	93	60
Fecal Col. (#/100 ml)	31616	2,800	90	240	<2	>8,000	>6,000	17	17
Fecal Strep. (#/100 ml)	31679	66	22	140	60	720	60	22	15
FC/FS	---	42.4	4.09	1.71	<.03	>11.1	100	0.77	1.13
Cl^-	00940	--	--	4,340	5,680	5,240	5,600	6,520	3,130
$SO_4^=$	00945	--	263	408	792	709	771	893	459
Chlor. a (mg/m3)		--	--	11.0	23.2	22.4	15.9	50.7	41.4
Iron (ug/l)	01045	--	--	179	189	151	233	219	219
Lead (ug/l)	01051	<3.0	--	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Mercury (ug/l)	71900	0.47	0.17	8.4	4.4	<0.08	0.18	<0.08	4.6

Table B.W.2. Water Quality of Theodore Industrial Park Area (Station P5, Upper North Fork Deer River) (Continued, page 5 of 5)

Parameters Date Time	Storet No.	4/20 --	5/17 10:35	5/31 14:10	6/15 13:20	6/30 12:40	7/12 12:20	7/28 11:00	8/9 10:30
T-PO$_4$ (mgP/l)	00665	--	.13	<.02	.18	.03	0.15	0.12	0.047
O-PO$_4$ (mgP/l)	00671	--	<.002	.004	.040	.006	<0.002	0.008	<0.002
TKN (mgN/l)	00625	--	3.17	1.6	3.3	3.1	4.2	2.9	2.0
NH$_3$ (mgN/l)	00610	--	.74	.46	.92	2.2	1.8	1.4	0.44
NO$_2$-NO$_3$ (mgN/l)	00630	--	.015	.127	.060	.013	0.010	0.034	0.028
BOD$_5$ (mg/l)	00310	--	15	5.1	3.8	2.6	7.8	1.4	3.1
TOC (mg/l)	00680	--	21	8.1	13	14	25	15	10.0
Temp (°C)	00010	--	25.0	34.0	31.0	31.0	27.5	28.8	30.0
Sp. Cond. (umhos/cm)	00094	--	675	619	510	519	658	385	286
TS (mg/l)	00500	--	421	3,550	525	352	412	271	250
TDS (mg/l)	70300	--	418	3,544.4	515	342	399	265	240
SS (mg/l)	00530	--	3.0	5.6	10	10	13	6	5.0
Turbidity (NTU)	00076	--	13	7.8	15	7.0	5.6	5.2	8.6
Color (CPU)	00080	--	100	60	45	40	40	45	55
Hardness (mg/l @ CaCO$_3$)	00900	--	51.0	84.0	54.0	1,880	140	160	218
Alkalinity (mg/l @ CaCO$_3$)	00410	--	172	111	381	127	140	97	68
pH	00400	--	6.85	7.3	7.6	7.6	6.9	7.3	7.4
DO (mg/l)	00299	--	0.5	6.2	3.4	2.4	0.25	2.55	1.9
DO (% sat.)	00301	--	6	86	47	32	3	33.6	25.0
Fecal Col. (#/100 ml)	31616	--	90	1,040	Comp. Inhib.	8,400	76,000	900	1,750
Fecal Strep. (#/100 ml)	31679	--	690	132	30	17	450	130	355
FC/FS	---	--	0.13	7.88	--	494	--	6.92	4.93
Cl$^-$	00940	--	--	22	37	40	74	43	20
SO$_4^=$	00945	--	38.1	61.7	69.3	49.5	64.8	37	41
Chlor. a (mg/m^3)		--	--	11.5	--	5.18	2.53	2.82	2.24
Iron (ug/l)	01045	--	--	1,680	1,100	681	1,570	1,350	2,280
Lead (ug/l)	01051	--	--	15	22	7.5	<3.0	<3.0	<3.0
Mercury (ug/l)	71900	--	2.1	12	4.4	0.08	0.62	0.85	1.1

Source: Environmental Science and Engineering, Inc., 1977.



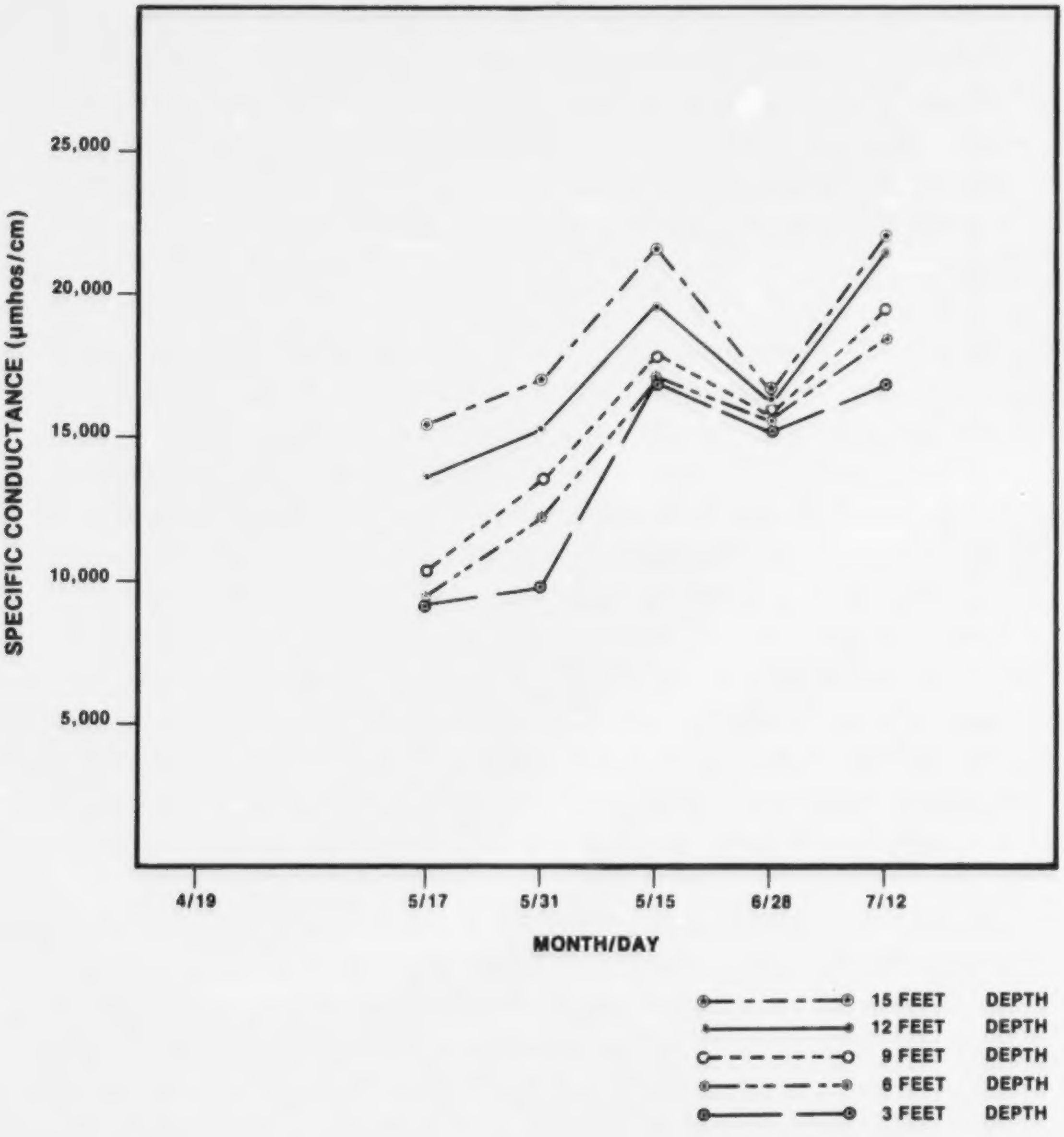
*DISSOLVED OXYGEN VALUES ARE AVERAGES OF P2, P3, AND P4 FROM THREE CANAL STATIONS, HIGH TIDE

Figure B.W.2
DISSOLVED OXYGEN* VS TIME AND DEPTH AT THE THEODORE BARGE CANAL SPRING AND SUMMER, 1977

SOURCE: Environmental Science and Engineering, Inc., 1977.

REGION IV
U.S. ENVIRONMENTAL PROTECTION AGENCY ENVIRONMENTAL IMPACT STATEMENT FOR IDEAL BASIC INDUSTRIES

PROPOSED CEMENT MANUFACTURING PLANT THEODORE INDUSTRIAL PARK
MOBILE, ALABAMA



*SPECIFIC CONDUCTIVITY VALUES ARE AVERAGES OF P2, P3, and P4 FROM THREE CANAL STATIONS, HIGH TIDE

Figure B.W.3

SPECIFIC CONDUCTIVITY* VS. TIME AND DEPTH AT THE THEODORE BARGE CANAL SPRING AND SUMMER, 1977

SOURCE: Environmental Science and Engineering, Inc., 1977.

REGION IV
U.S. ENVIRONMENTAL PROTECTION AGENCY ENVIRONMENTAL IMPACT STATEMENT FOR IDEAL BASIC INDUSTRIES

PROPOSED CEMENT MANUFACTURING PLANT THEODORE INDUSTRIAL PARK MOBILE, ALABAMA

direct result of the poor flushing and limited vertical mixing characteristic of dead-end, finger canals and channels that have limited freshwater inflow. Flushing does occur in the early spring as a result of the higher freshwater inflows from the Mobile River and local rainfall. Nutrient levels in the canal are high and support a highly productive phytoplankton population which aggravates the dissolved oxygen problem by increasing the organic loading on the lower stratification layer.

The limited flushing results in poor water quality which is aggravated by existing point source industrial discharges and by stormwater runoff into the tributaries of the canal. The point source discharges are listed in Table B.W.3. The nonpoint discharges are listed in Table B.W.4. Past industrial discharges of phenol, BOD, COD, oil and grease, nitrogen compounds, phosphorus compounds, and metals into North Fork Deer River have resulted in significant degradation of the freshwater marsh system. The point source and stormwater discharges from Marion Oil Company (listed in Table B.W.3) will continue to cause localized impacts in the headwaters of the marsh system. Point source discharges from Degussa-Alabama, Kerr-McGee, and Airco, and stormwater runoff from impervious surfaces on Airco, Kerr-McGee, and Degussa- Alabama property will continue to generate wasteloads into the barge canal.

Nonpoint wasteloads were developed using the wasteload models EPAURA and EPARRB (SARPC, 1976). These models were designed only to generate a gross estimate of potential nonpoint wasteloads. The model outputs presented have not been calibrated and verified with site-specific data. In fact, model input data has been set from nonpoint source loading factors developed from loading studies in Atlanta, Georgia, and other urban areas scattered around the country. Consequently, the nonpoint loadings presented in Table B.W.4 must be analyzed and interpreted with care. For example, the calculated wasteloads for suspended sediments are questionable. The Ideal Basic Industries property (71 hectares) (175 acres) has a calculated wet season average daily discharge of 4,054 kilograms (8,940 pounds) of sediment. This is a wet season load

Table B.W.3. Theodore Barge Canal Point Source Daily Flows and Loads (lbs/day) (PH1:1977; PH2:1978 and Beyond)

	Degussa-Ala		Kerr-McGee		Airco		Marion		Ideal	
	PH1 1977	PH2 1992	PH1 1977	PH2 1992	PH1 1977	PH2 1992	PH1 1977	PH2 1992	PH1 1977	PH2 1992
Flow (MGD)	1.370	1.501	0	1.470	.700	.700	.050	.050	--	--
Flow (CFS)	2.119	2.324	0	2.228	1.083	1.083	.077	.077	--	--
TOC	154	154	0	--	--	--	--	--	--	--
TDS	18515	18515	0	--	--	--	133	133	--	--
TSS	571	571	0	--	199	199	31	31	--	--
Chlorides	10800	14622	156124	--	--	--	--	--	--	--
N	9	507	0	--	--	--	10.4	10.4	--	--
Oil/Grease	--	--	0	--	58	58	14	14	--	--
Cr	--	--	0	--	5.9	5.9	--	--	--	--
Cd	--	--	0	--	--	--	--	--	--	--
Mn	--	--	0	--	--	--	--	--	--	--
Phenol	--	--	0	--	5.9	5.9	0.28	0.28	--	--
P	--	--	0	--	4	4	--	--	--	--
COD	--	--	0	--	--	--	228	228	--	--
BOD	--	--	0	--	--	--	45	45	--	--

-- Not available.

Source: SARPC, 1976.

Table B.W.4. Theodore Canal Nonpoint Flows and Loads (Wet Season Average Daily Loads and Flows)*

Parameter	Degussa-Al	Kerr-McGee	Other Ind.	Open Area	Airco	Ideal	Lone Star	Marion	Suburban
Flow (MGD)	1.714	3.374	2.593	1.481	1.616	.512	.138	1.735	.701
COD	5150	9850	1875	1020	4278	374	107	5200	73
BOD	1045	2005	383	749	870	77	22	1065	11
Sediment	13260	28220	46620	40	11440	8940	1980	1320	1140
Total Solids	83500	160500	30600	17450	70000	6100	1765	85000	2340
N	170	330	104	.37	142	9	5.3	161	3.9
P	63	143	60.7	14	61	11.5	3.3	64	2.4
K	166	353	583	5	143	123	2.5	17	14
Zn	63	120	23	13	53	4.5	1.3	64	.6
Cu	12	23	4.5	2.5	10	.9	.25	12.3	.36
Pb	39	74	14.1	8	32	2.8	.8	39.4	.42
Ni	3.4	6.5	1.25	.7	2.8	.25	.07	3.4	.11
Hg	4.3	8.3	1.55	.9	.36	.31	.09	4.37	.13
Cr	6.8	13.0	2.5	1.4	5.6	.5	.14	6.9	.06
Cd	.17	.32	.06	.035	.15	.012	.0035	.17	.017

* Wet months, storm every two days, 1/2 inch of rain over a two hour period, intensity of rainfall 1/4 inch/hour, average wet season daily loads from infiltrative and erodible surfaces, plus 1/2 of a storm event "first flush" load from impervious surfaces, constitute the total daily wet season nonpoint load.

Source: SARPC, 1976.

of 58 kilograms per hectare (51 pounds per acre) per day. This loading rate is an order of magnitude higher than similar values generated for lands of similar slope, soil type, cover, and impervious surface coverage (Environmental Science and Engineering, Inc., 1977). Ground truth observations at the site did not provide evidence of severe erosion that would be associated with such high loadings, except for slumpage along the banks of the industrial canal.

Existing point source wasteloads from industrial organic oxygen-demanding wastewater discharges are either low or undocumented. Consequently, there is no available evidence that the dissolved oxygen problem in the canal is attributable to industrial point source discharges. The poor mixing and flushing due to the physical configuration of the canal results in stratification. The natural organic sources and nonpoint source organic wasteloads cause an oxygen gradient with severe depletion in the bottom waters. Consequently, the canal has no assimilative capacity for additional oxygen-demanding wasteloads.

Therefore, the recommendation has been made that the only point source discharges to the canal which should be permitted are those which have a better water quality than the canal waters and meet Alabama's Fish and Wildlife Water Quality criteria (SARPC, 1977). This recommendation is being implemented by the U.S. EPA.

Preliminary analysis of available water quality data and modeling results strongly indicates that the existing dissolved oxygen levels in the Theodore Barge Canal may have little, if any, effect on the Mobile Bay system (SARPC, 1976; U.S. Army Corps of Engineers, Mobile District, 1977). This conclusion is supported by information that indicates that low dissolved oxygen levels in Mobile Bay are caused by the complex hydrodynamic and ecological processes within the bay. These data and observations demonstrate that when low levels are noted in the Theodore Barge Canal, low levels have also been documented throughout the Bay system.

PROJECTED 1992 ENVIRONMENT

From the water resources standpoint, the primary change at the plant site by 1992 will be the construction of the Theodore Ship Channel along the alignment of the present barge canal. This project will be executed by the U.S. Army Corps of Engineers, Mobile District.

The ship channel project (see Figures B.W.4 and B.W.5) will involve:

1. A channel of 12-meter (40-foot) depth and 91-meter (300-foot) bottom width, occupying a right-of-way 200 to 300 meters (650 to 1,000 feet) wide;
2. A bay cut of 122-meter (400-foot) bottom width providing deep-water access to the Mobile Bay channel;
3. A 17-hectare (42-acre) turning basin at the end of the ship channel near Rangeline Road; and
4. An extension of the existing barge canal with 4-meter (12-foot) depth west of Rangeline Road.

A second turning basin at the mouth of the land cut has been authorized but will not be included in the initial construction program (U.S. Army Corps of Engineers, Mobile District, 1977).

The proposed ship channel and barge canal extension have been modeled with the Pacific Northwest Water Laboratories model to determine estimated water quality and residence times (SARPC, 1976). A theoretical dye study was performed and run for 20 tidal cycles. It was determined that at the landward terminus of the canal, 70.4 percent of the dye would be removed after 20 days. It was concluded that this flushing rate is too slow to effectively remove waste and will create a condition where water quality can degrade below Fish and Wildlife Water Quality Standards.

A combined industrial waste treatment facility with a common outfall into Mobile Bay has been proposed for the Theodore Industrial Park. Wastewater dispersion was modeled by the Army Corps of Engineers Mobile Bay model and by the Dynamic Estuaries Model (DEM) (SARPC, 1976). The

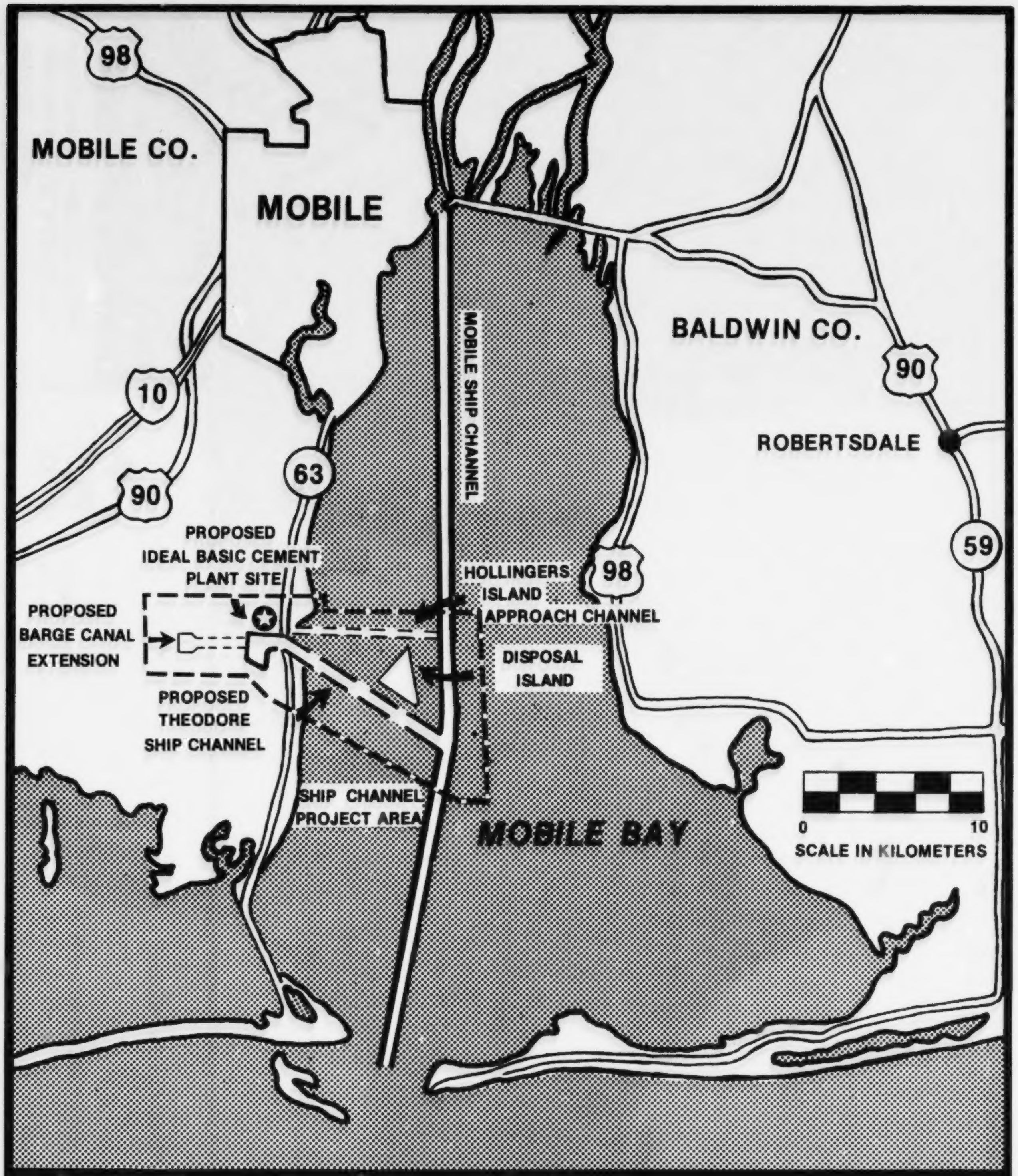

98
MOBILE CO.
MOBILE
10
90
63
MOBILE SHIP CHANNEL
BALDWIN CO.
90
ROBERTSDALE
59
98
PROPOSED
IDEAL BASIC CEMENT
PLANT SITE
PROPOSED
BARGE CANAL
EXTENSION
HOLLINGERS
ISLAND
APPROACH CHANNEL
DISPOSAL
ISLAND
PROPOSED
THEODORE
SHIP CHANNEL
SHIP CHANNEL
PROJECT AREA
MOBILE BAY
0
10
SCALE IN KILOMETERS

Figure B.W.4
PLAN VIEW OF PROPOSED CORPS PROJECT–
ENTIRE HARBOR

SOURCE: U.S. Army Engineer District, Mobile Corps of Engineers, 1975.

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STATEMENT FOR IDEAL BASIC INDUSTRIES

PROPOSED CEMENT MANUFACTURING
PLANT THEODORE INDUSTRIAL PARK
MOBILE, ALABAMA

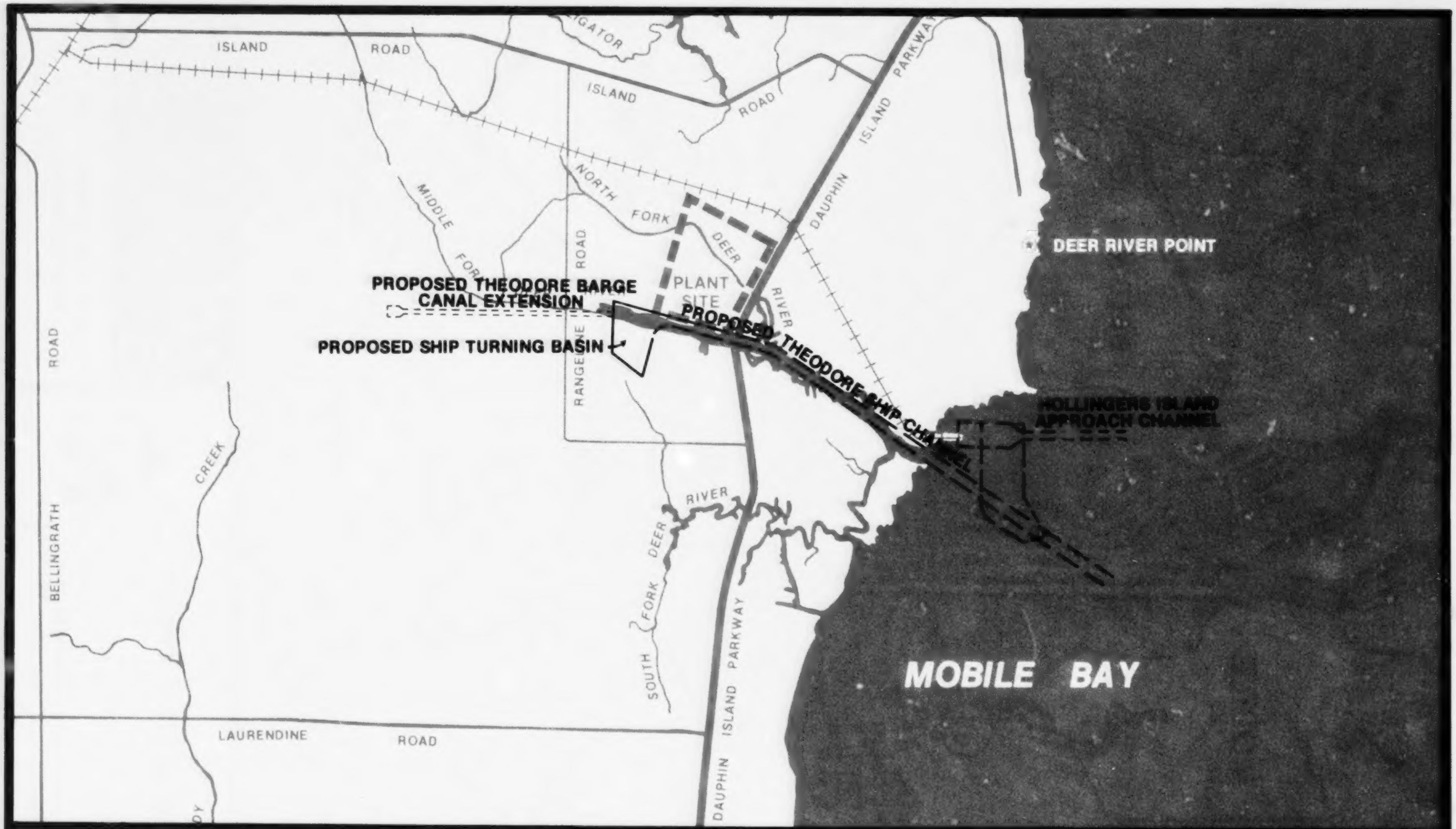
ISLAND
ROAD
IGATOR
ISLAND
ROAD
DAUPHIN ISLAND PARKWAY
NORTH FORK DEER RIVER
MIDDLE FORK
RANGELINE ROAD
PLANT SITE
DEER RIVER POINT
PROPOSED THEODORE BARGE CANAL EXTENSION
PROPOSED SHIP TURNING BASIN
PROPOSED THEODORE SHIP CHANNEL
HOLLINGERS ISLAND APPROACH CHANNEL
ROAD
CREEK
BELLINGRATH
RIVER
SOUTH FORK DEER
DAUPHIN ISLAND PARKWAY
MOBILE BAY
LAURENDINE ROAD
0 0.5 1
SCALE IN KILOMETERS
N

Figure B.W.5
PLAN VIEW OF PROPOSED CORPS PROJECT

SEE FIGURE B.W.4 FOR VIEW OF ENTIRE HARBOR.

SOURCE: U.S. Army Engineer District, Mobile Corps of Engineers, 1975.

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PLANT THEODORE INDUSTRIAL PARK
MOBILE, ALABAMA

Corps performed simulated dye studies at two locations with the physical model of the bay to estimate the movement of industrial effluent from an outfall. The DEM was run to determine the concentration gradients for five alternative outfall locations.

The U.S. Army Corps of Engineers, Mobile District, has reviewed an application by the Board of Water and Sewer Commissioners of the City of Mobile for construction of the pipeline as shown in Figure B.W.6. A proposed discharge point has been established, and the Corps is preparing an Environmental Impact Statement on this project.

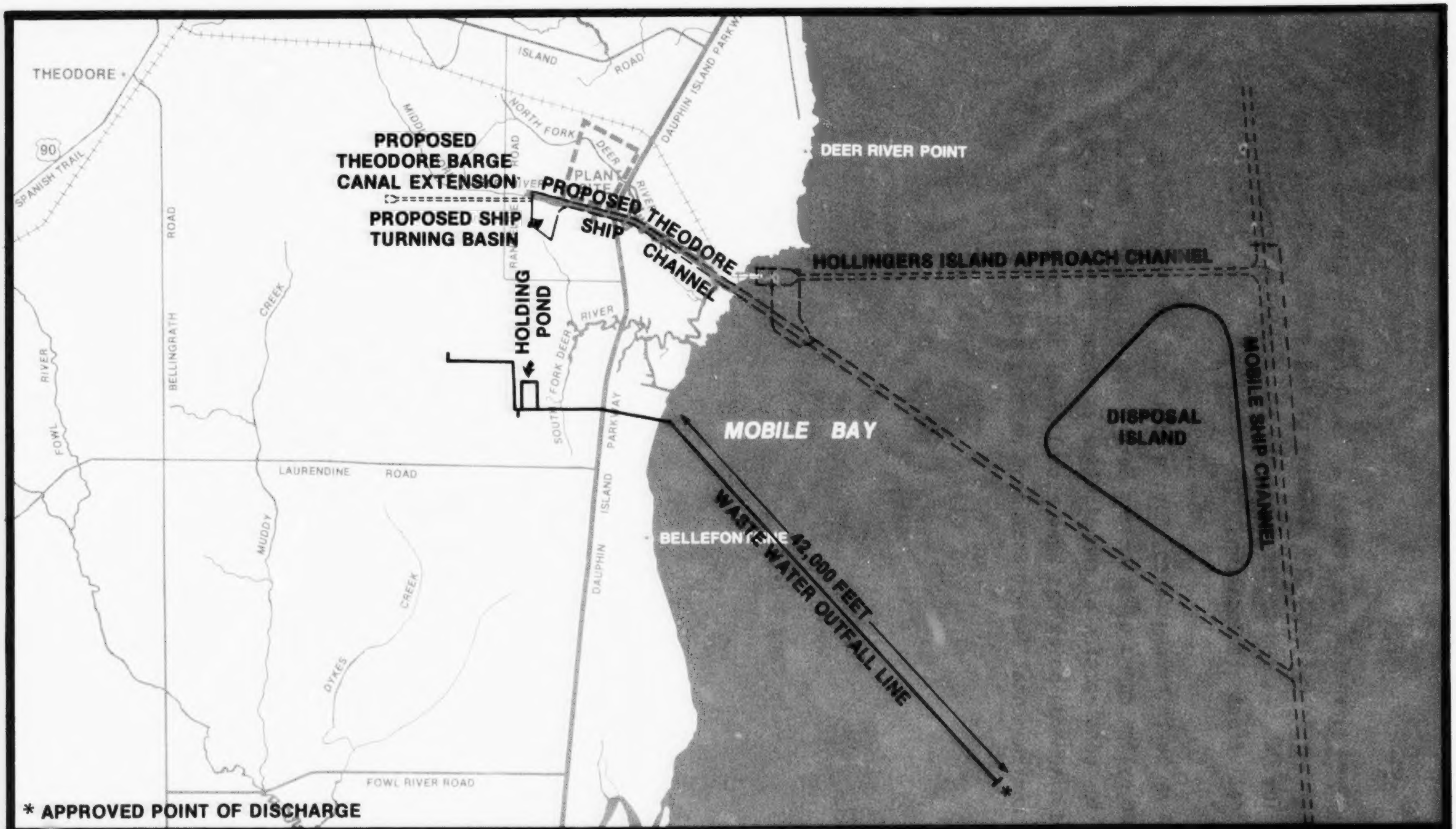
THEODORE
90
SPANISH TRAIL
ISLAND
ROAD
NORTH FORK
DEER
PLANT
RIVER
DAUPHIN ISLAND PARKWAY
PROPOSED
THEODORE BARGE
CANAL EXTENSION
PROPOSED SHIP
TURNING BASIN
PROPOSED THEODORE
SHIP
CHANNEL
DEER RIVER POINT
HOLLINGERS ISLAND APPROACH CHANNEL
HOLDING
POND
SOUTH FORK DEER RIVER
DISPOSAL
ISLAND
MOBILE SHIP CHANNEL
MOBILE BAY
BELLINGRATH ROAD
CREEK
FOWL RIVER
LAURENDINE ROAD
MUDDY
CREEK
DYKES
DAUPHIN ISLAND PARKWAY
BELLEFONTAINE
42,000 FEET
WASTE WATER OUTFALL LINE
FOWL RIVER ROAD
*
* APPROVED POINT OF DISCHARGE

Figure B.W.6
PROPOSED WASTEWATER OUTFALL IN MOBILE BAY

SOURCE: Board of Water and Sewer Commissioners of the City of Mobile, 1977.
Environmental Science and Engineering, Inc., 1977.

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SCALE IN KILOMETERS

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STATEMENT FOR IDEAL BASIC INDUSTRIES

PROPOSED CEMENT MANUFACTURING
PLANT THEODORE INDUSTRIAL PARK
MOBILE, ALABAMA

QUARRY SITE

EXISTING ENVIRONMENT (1977)

Alabama and Mobile River Basins

General Description

The headwaters of the Alabama River flow out of the Blue Ridge Mountains in northwest Georgia. Numerous tributaries flow out of the well-defined valleys of the Blue Ridge and combine to form the Etowah and Oostanaula Rivers. After falling some 259 meters (850 feet) out of the mountains, these rivers unite at Rome, Georgia, and form the Coosa River which flows southwesterly into Alabama. Just south of the Coosa River is another major tributary to the Alabama River, the Tallapoosa River. The Tallapoosa also rises in northwest Georgia and flows southwest into Alabama. The Alabama-Coosa-Tallapoosa Basin is shown in Figure B.W.7. The Coosa River Basin encompasses both the Sand Mountain and Southern Appalachian Ridge and Valley Land Resource Areas while the Tallapoosa River flows mainly through the Southern Piedmont Land Resource Area.

The Coosa and the Tallapoosa Rivers converge just above Montgomery, Alabama, at an elevation approximately 30 meters (100 feet) above mean sea level. Here the Alabama River begins its 525-kilometer (315-mile) southwesterly course, joining the Tombigbee River near Malcom, Alabama, and forming the Mobile River.

From Montgomery to the mouth, the Alabama River flows through the Southern Coastal Plain and Alabama and Mississippi Blackland Prairies. These areas consist of gently rolling hills which dip southwesterly toward the Gulf of Mexico. Because of the generally flatter topography and the more easily worked alluvial sediments of the coastal plain, the river in this area slows down, the slopes are reduced, and the river takes on a slow-moving, meandering character.

The confluence of the Alabama and Tombigbee rivers is 72 river kilometers (45 miles) upstream of Mobile. The Claiborne Lock and Dam

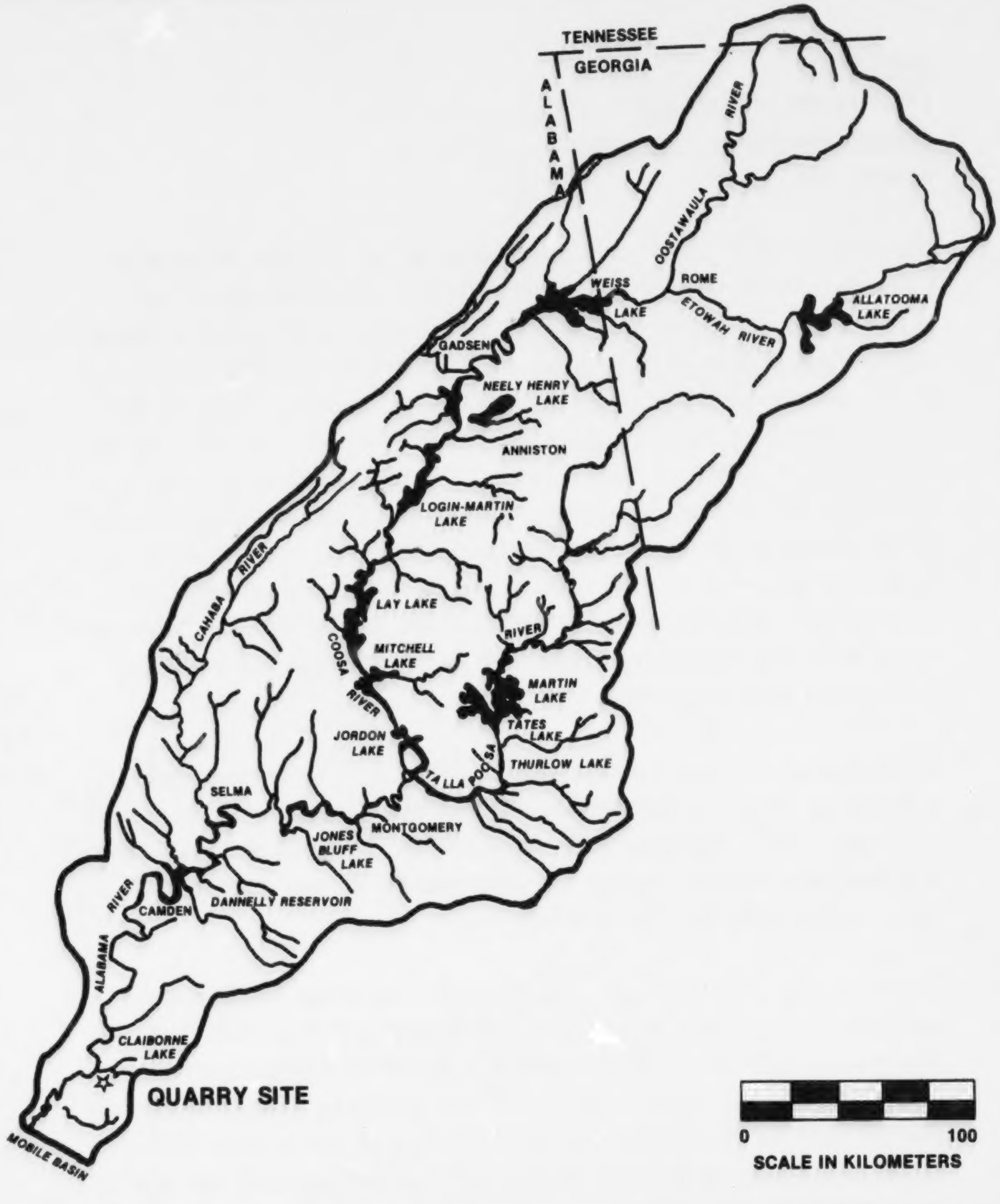
TENNESSEE
GEORGIA
ALABAMA
RIVER
OOSTAWAULA
WEISS
LAKE
ROME
ETOWAH RIVER
ALLATOOMA LAKE
GADSEN
NEELY HENRY LAKE
ANNISTON
LOGIN-MARTIN LAKE
CAHABA RIVER
LAY LAKE
RIVER
MITCHELL LAKE
COOSA RIVER
MARTIN LAKE
TATES LAKE
JORDON LAKE
TALLAPOOSA
THURLOW LAKE
SELMA
MONTGOMERY
JONES BLUFF LAKE
DANNELLY RESERVOIR
CAMDEN
ALABAMA RIVER
CLAIBORNE LAKE
QUARRY SITE
MOBILE BASIN
0
100
SCALE IN KILOMETERS

Figure B.W.7
MAP OF ALABAMA-COOSA-ETOWAH RIVER BASIN

(Adapted from Associated Water and Air Resources Engineers, Inc., 1975).

SOURCE. Environmental Science and Engineering, Inc., 1977.

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is approximately 37 river kilometers (23 river miles) upstream of the proposed quarry site, which is 180 river kilometers (110 river miles) from Mobile.

The confluence of the Alabama and Tombigbee rivers marks the head of the Mobile River. Approximately 8 kilometers (5 miles) downstream of this confluence, the southerly flowing Mobile River enters a deltaic floodplain and separates into a network of distributaries. This network creates a braided stream pattern which extends approximately 56 kilometers (35 miles) to the head of Mobile Bay. The westerly channel in this braided system is called the Mobile River and carries about 25 percent of the annual average flow (Alabama Water Improvement Commission, 1976). The eastern distributary is the Tensaw River, which carries approximately 28 percent of the annual average flow. The other major distributaries along this stretch are the Apalachee and Blakeley rivers which account for 22 percent and 25 percent of the annual average flow, respectively.

The low channel slopes of the Mobile River and of the basin distributaries result in generally low current velocities. A large portion of the Mobile River Basin waters are influenced by a diurnal tide. Much of the Mobile River is subject to saltwater intrusion along the channel bottoms except during high flow periods.

Precipitation

Average annual precipitation in Alabama varies from about 1,270 millimeters (50 inches) in the northwest and central portions of the state to almost 1,778 millimeters (70 inches) east of Mobile, Alabama. In the lower Alabama and Mobile River basins, mean annual precipitation values display the greatest variation of any area of the state.

In northern Monroe County, precipitation averages 1,372 millimeters (54 inches) per year. In the southern part of the county, this value increases to 1,422 millimeters (56 inches) per year. Values continue to increase to the south. At Mobile, mean annual precipitation is almost 1,702 millimeters (67 inches).

Mean monthly and mean annual precipitation values for five stations in southwest Alabama are shown on Table B.W.5. Precipitation is lowest at the two northernmost stations, Thomasville and Greenville, whereas precipitation is highest at the southernmost station, Mobile. Precipitation is fairly uniform throughout the year in southwest Alabama. The driest months are October and November; the wettest months are March and July.

Topography

The Alabama River Basin encompasses five distinct land resource areas characterized by differences in topography, soils, land use, and climate. These areas are illustrated in Figure B.W.8.

The Southern Appalachian Ridge and Valley Land Resource Area occurs in the northern portion of the Alabama River Basin. This area consists of wide, gently rolling valleys and steep, rough ridges all trending northeast/southwest. Elevations in the valleys range from 150 to 210 meters (500 to 700 feet) above mean sea level (msl), whereas elevations on the higher ridges sometimes reach 610 meters (2,000 feet) above msl. This area is known geologically as the Folded Appalachians.

The Sand Mountain Land Resource Area occurs in the northwest portion of the basin. This area is characterized by a series of plateaus underlain by a sequence of thick shales and sandstones. The basal sandstone outcrops and forms permanent cliffs overlooking the valleys so that plateau margins stand out sharply.

The Southern Piedmont Land Resource Area comprises about 25 to 30 percent of the basin. The area is characterized by rolling uplands formed over deeply weathered, crystalline metamorphic rocks.

Table B.W.5. Monthly and Annual Norms of Temperature (°F) and Precipitation (Inches) in Southwest Alabama

STATION	JANUARY		FEBRUARY		MARCH		APRIL		MAY		JUNE	
	°F Temp.	Inches Precip.	°F Temp.	Inches Precip.	°F Temp.	Inches Precip.	°F Temp.	Inches Precip.	°F Temp.	Inches Precip.	°F Temp.	Inches Precip.
Thomasville, Ala. 1941-1970 33 miles N-NW of quarry site	47.4	4.60	50.4	4.99	56.5	7.15	65.8	5.36	72.7	3.91	78.8	3.63
Greenville, Ala. 1941-1970 62 miles NE of of quarry site	49.2	4.79	52.3	5.06	57.9	6.81	66.8	5.23	73.5	3.99	79.2	4.20
Mobile, Ala. 1941-1970 63 miles SW of quarry site	61.1	4.71	64.1	4.76	69.5	7.07	78.0	5.59	85.0	4.52	89.8	6.09
Brewton, Ala. 1941-1970 40 miles SE of quarry site	50.5	4.56	53.3	5.03	58.5	6.61	66.3	5.68	72.8	4.36	78.6	5.50
Bay Minette, Ala. 1941-1970 42 miles S-SW of quarry site	51.7	4.64	54.4	4.73	59.8	7.29	68.0	5.50	74.6	4.86	79.8	5.84

Table B.W.5. Monthly and Annual Norms of Temperature (°F) and Precipitation (Inches) in Southwest Alabama (Continued, page 2 of 2)

STATION	JULY		AUGUST		SEPTEMBER		OCTOBER		NOVEMBER		DECEMBER		ANNUAL	
	°F Temp.	Inches Precip.	°F Temp.	Inches Precip.	°F Temp.	Inches Precip.	°F Temp.	Inches Precip.	°F Temp.	Inches Precip.	°F Temp.	Inches Precip.	°F Temp.	Inches Precip.
Thomasville, Ala. 1941-1970 33 miles N-NW of quarry site	80.5	6.06	80.1	4.63	75.4	3.73	66.0	2.96	55.3	3.71	48.7	5.65	64.8	56.38
Greenville, Ala. 1941-1970 62 miles NE of quarry site	80.8	6.44	80.5	4.45	76.1	4.54	66.8	2.31	56.4	4.21	50.3	5.46	65.8	57.49
Mobile, Ala. 1941-1970 63 miles SW of quarry site	90.5	8.86	90.6	6.93	86.5	6.59	79.7	2.55	69.5	3.39	63.0	5.92	77.3	66.98
Brewton, Ala. 1941-1970 40 miles SE of quarry site	80.3	7.65	80.1	5.71	75.6	5.21	65.9	2.80	56.1	4.12	51.1	5.28	65.8	62.51
Bay Minette, Ala. 1941-1970 42 miles S-SW of quarry site	81.0	7.64	81.1	6.87	77.3	6.17	68.9	2.84	58.7	3.93	52.8	5.46	67.3	65.77

Source: U.S. National Climatic Center, 1976.

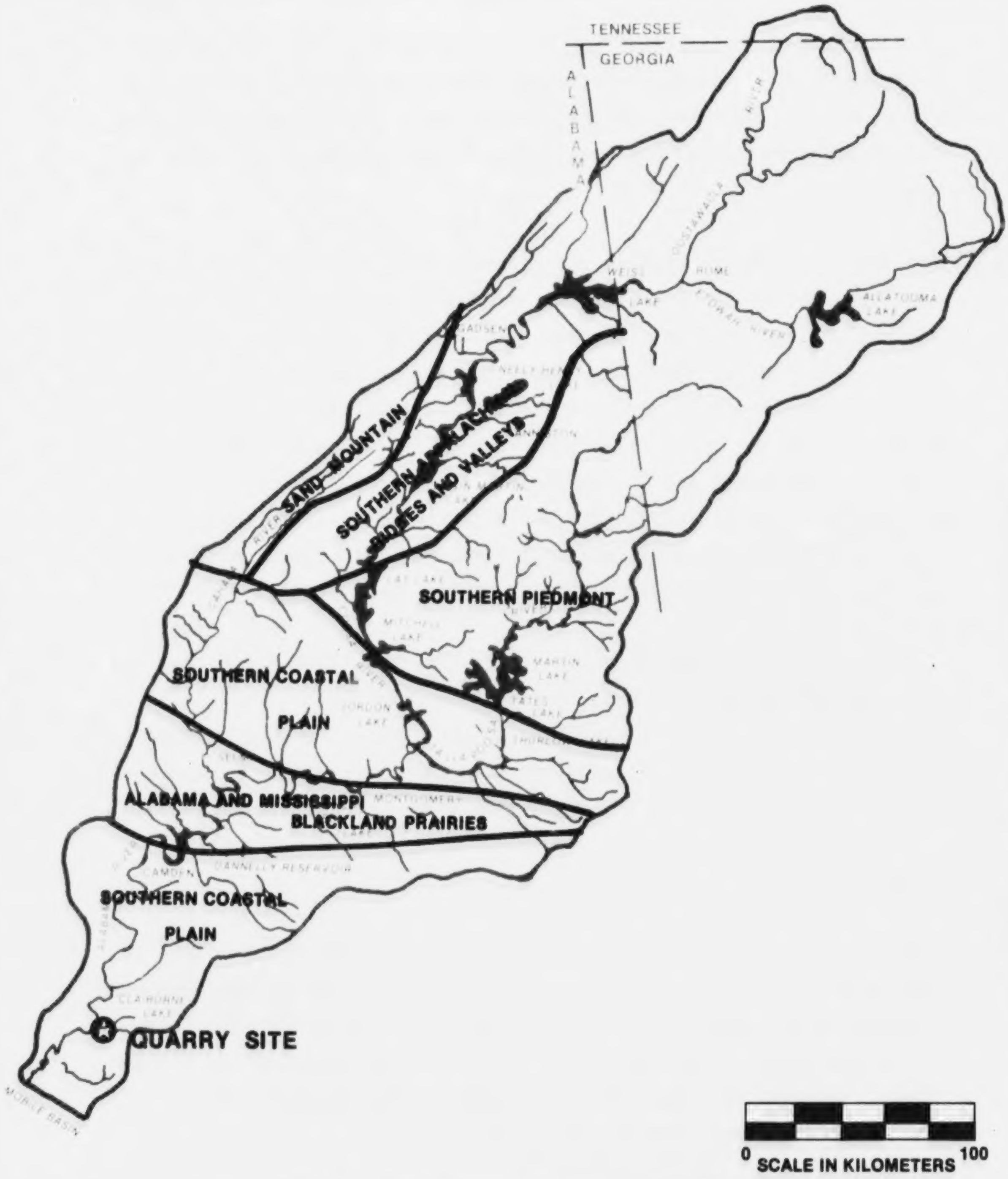
TENNESSEE
GEORGIA
ALABAMA
RIVER
OOSTANAULA
WEISS LAKE
ROME
ETOWAH RIVER
ALLATOONA LAKE
GADSEN
NEELY HENRY LAKE
ANNISTON
SAND MOUNTAIN
SOUTHERN APPALACHIAN RIDGES AND VALLEYS
LOGAN MARTIN LAKE
RIVER
LAY LAKE
SOUTHERN PIEDMONT
RIVER
MITCHELL LAKE
MARTIN LAKE
RIVER
SOUTHERN COASTAL PLAIN
JORDON LAKE
YATES LAKE
TALLAPOOSA
THURLOW LAKE
SELMA
MONTGOMERY
ALABAMA AND MISSISSIPPI BLACKLAND PRAIRIES
LAKE
RIVER
CAMDEN
DANNELLY RESERVOIR
SOUTHERN COASTAL PLAIN
ALABAMA
CLAIBORNE LAKE
QUARRY SITE
MOBILE BASIN
0
100
SCALE IN KILOMETERS

Figure B.W.8

MAJOR LAND RESOURCE AREAS OF THE ALABAMA RIVER BASIN

(Adapted from Associated Water and Air Resources Engineers, Inc., 1975).

SOURCE: Environmental Science and Engineering, Inc., 1977.

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Elevations generally range from 210 to 300 meters (700 to 1,000 feet) above msl. The highest elevation in the state [Cheaha Mountain--729 meters (2,390 feet)] occurs in this area. Though once a rich cotton-producing area, the area today is used primarily for pine plantations.

The Southern Coastal Plains Land Resource Area comprises most of the southern half of the basin and is divided by the Alabama and Mississippi Blackland Prairies Land Resource Area, more commonly termed the Black Belt. The northern, or upper, portion of the Coastal Plain is generally rolling land, while the lower Coastal Plain is smoother. Elevations in the upper Plain vary from 90 to 180 meters (300 to 600 feet) above msl and in the lower Plain from 90 to 150 meters. Distinct topographical changes, which trend east-west through the Coastal Plain, reflect differential weathering and former higher sea levels. The proposed quarry site is in the lower Coastal Plain.

The Black Belt Land Resource Area has a gently rolling topography trending east-west through the basin. The name derives from the rich, black soil which is prevalent in the area. The area is ideally suited for agriculture and today is used as pastureland. Elevations generally range from 30 to 90 meters (100 to 300 feet) above msl.

Flow

The Alabama River is gaged at several locations, and measurements of streamflow and water elevation are made and collected by the USGS and the U.S. Army Corps of Engineers. Table B.W.6 summarizes the locations and types of data obtained for the various gages on the Alabama River. Streamflow measurements are made at two locations on the river--at Montgomery and at Claiborne.

At Montgomery, the river drains some 39,109 square kilometers (15,100 square miles). The average discharge of the river at this point over the period 1928 to 1975 was 672 cubic meters per second (cms) [23,740

Table B.W.6. USGS Gaging Stations on the Alabama River

Gaging Station Name	USGS ID Number	Miles Upstream From Mouth	Miles Upstream From Quarry Site	Type of Data Recorded	Period of Record	Drainage Area Sq. Miles
Alabama River at Montgomery, Ala.	02419988	296.9	243.9	Gage Heights	1890 to Present	15,000
Alabama River near Montgomery, Ala.	02420000	287.6	234.6	Discharge and Gage Heights	1927 to Present	15,100
Alabama River at Jones Bluff Lock and Dam near Benton, Ala.	02421351	245.4	192.4	Gage Heights	1972 to Present	16,300
Alabama River at Selma, Ala.	02423000	214.8	161.8	Gage Heights	1900-1913 1928-1970 1971 to Present	17,100
Alabama River at Millers Ferry Lock and Dam near Monroeville, Ala.	02427506	142.2	89.2	Gage Heights	1968 to Present	20,700
Alabama River at Claiborne, Ala.	02429500	76.1	23.1	Discharge and Gage Heights	1930 to Present	22,000

Source: U.S. Geological Survey, 1975.

cubic feet per second (cfs)]. The maximum discharge occurred on February 26, 1961, and was 8,014 cms (283,000 cfs); the minimum discharge occurred on November 24, 1941, and was 68.5 cms (2,420 cfs).

At Claiborne, Alabama, just north of the proposed quarry site, streamflow in the Alabama River has been measured by the USGS since 1930. The gage measures the discharge of approximately 57,000 square kilometers (22,000 square miles). Over the period of record, the average discharge at this point was 921 cms (32,540 cfs), and the maximum discharge was 7,560 cms (267,000 cfs) (March 7, 1961). The average monthly flows at Claiborne are plotted in Figure B.W.9.

Yields

Basin yields are useful in determining the relative characteristics of basins. At Montgomery the average basin yield is 0.017 cms per square kilometer (1.57 cfs per square mile), whereas in the reach between Montgomery and Claiborne the basin yield is only 0.0139 cms per square kilometer (1.27 cfs per square mile). Above Montgomery, the basin is mountainous with steep slopes and very rapid runoff. Below, in the coastal plain, slopes are more gentle and the topography is flatter. These features allow more infiltration of rainwater and more evapotranspiration and thus reduce the basin yield. Basin yields over the entire Alabama River Basin are shown on Figure B.W.10.

Water Resource Projects on the Alabama River

The Alabama and Mobile Rivers connect the proposed quarry site to Mobile by 95 river kilometers (59 river miles) of navigable waterway. The original improvement of the Alabama River, authorized in 1878, was a 1.2-meter (4-foot) deep channel from the mouth of the river to Wetumpka, Alabama. River traffic below Claiborne was generally limited to shallow draft movements of pulpwood and logs, crude oil, and sand and gravel. Under authority of the Rivers and Harbors Act of 1945, the U.S. Army Corps of Engineers, Mobile District, began

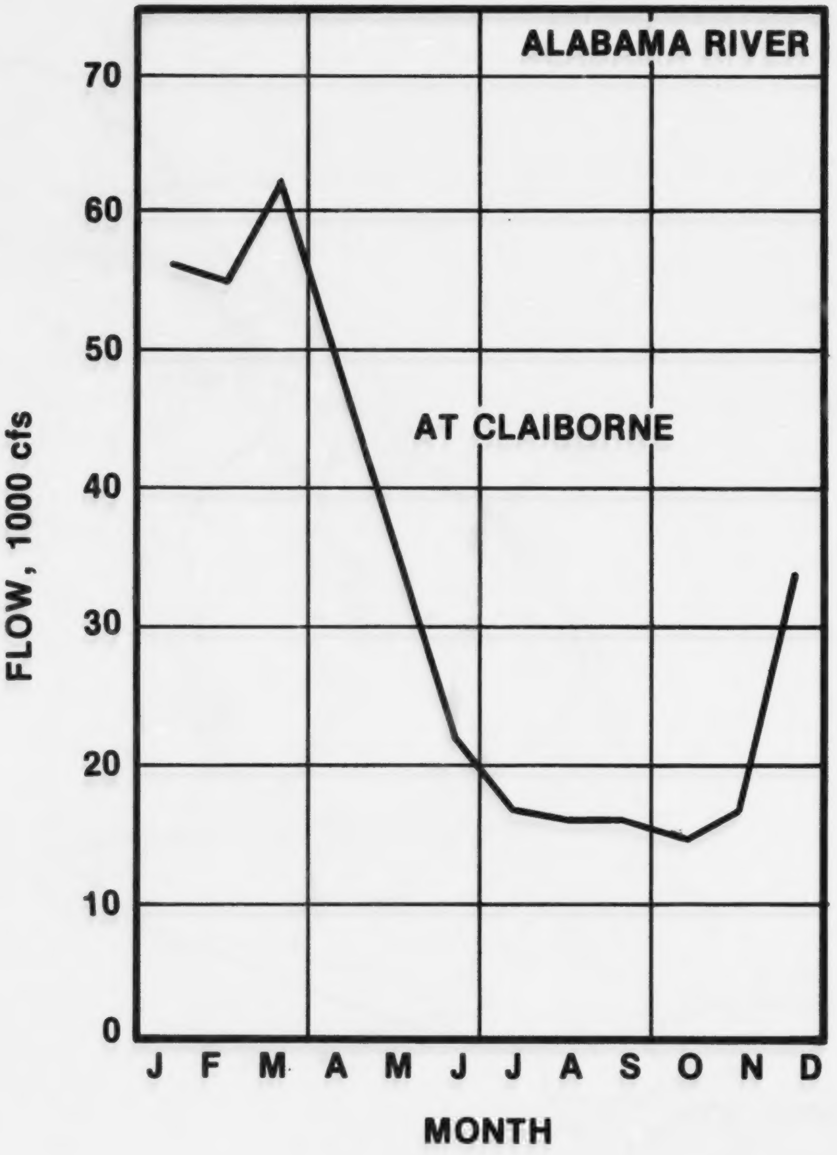

Figure B.W.9

AVERAGE MONTHLY FLOWS, ALABAMA RIVER AT CLAIBORNE, 1965-1974

SOURCE: Alabama Water Improvement Commission, 1976.

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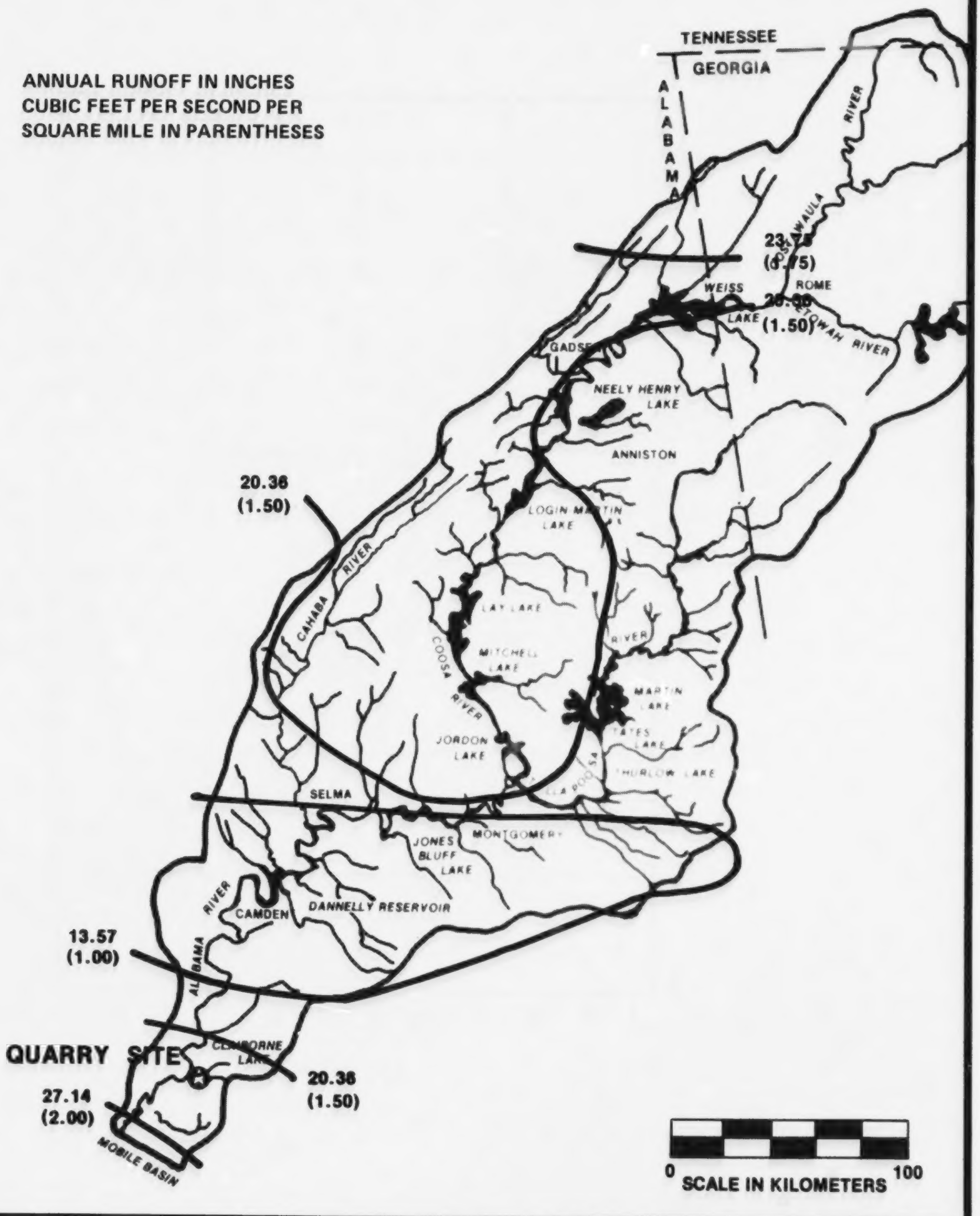
ANNUAL RUNOFF IN INCHES
CUBIC FEET PER SECOND PER
SQUARE MILE IN PARENTHESES
TENNESSEE
GEORGIA
ALABAMA
RIVER
OOSTANAULA
WEISS
LAKE
ROME
(1.50)
ETOWAH RIVER
GADS
NEELY HENRY
LAKE
ANNISTON
20.36
(1.50)
LOGIN MARTIN
LAKE
CAHABA RIVER
LAY LAKE
COOSA
MITCHELL
LAKE
RIVER
MARTIN
LAKE
RIVER
JORDON
LAKE
YATES
LAKE
TALLAPOOSA
THURLOW LAKE
SELMA
MONTGOMERY
JONES
BLUFF
LAKE
RIVER
CAMDEN
DANNELLY RESERVOIR
13.57
(1.00)
ALABAMA
QUARRY SITE
CLAIBORNE
LAKE
20.36
(1.50)
27.14
(2.00)
MOBILE BASIN
0
100
SCALE IN KILOMETERS

Figure B.W.10
ALABAMA RIVER BASIN
(Adapted from Associated Water and Air Resources
Engineers, Inc., 1975)

SOURCE: Environmental Science and Engineering, Inc., 1977.

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improvements on the waterway from Mobile to near Wetumpka, Alabama, in 1963.

Since that time, many improvements to navigation have been performed on the Alabama River. These improvements have included the construction of three lock and dam structures--Claiborne, river kilometer 131.6 (river mile 81.8); Millers Ferry, river kilometer 229 (river mile 142.3); and Jones Bluff, river kilometer 394.9 (river mile (245.4)-and the maintenance of a 2.7-meter (9-foot) deep, 60-meter (200-foot) wide navigation channel from the mouth of the river to Montgomery (U.S. Army Corps of Engineers, 1975). The channel to Claiborne was opened to river traffic in 1969. In 1973, 1,770,000 metric tons (1,950,000 tons) of cargo were transported on the waterway.

The Jones Bluff Lock and Dam consists of a navigation lock, gated spillway, and a small hydroelectric power plant. The normal pool elevation behind the dam is 38 meters (125 feet) above msl, and the normal pool below the dam is 24 meters (80 feet) above msl. The 142-kilometer (88-mile) long reservoir created by the dam (Jones Bluff Lake) has a total capacity of 289,000,000 cubic meters (234,200 acre-feet). As of 1975, the Jones Bluff project was 85 percent complete.

Millers Ferry Lock and Dam is located some 148 river kilometers (89 river miles) upstream of the proposed quarry site. The project consists of an earthen dike on the right bank, a concrete-gravity gated spillway in the river channel, and a powerhouse (three 25,000 kw units). The 172-kilometer (103-mile) long reservoir behind the dam has a total capacity of 409,300,000 cubic meters (331,800 acre-feet) and is maintained at an elevation of 24 meters (80 feet) above msl. The Millers Ferry project was completed in 1972.

The Claiborne Lock and Dam is located some 37 river kilometers (23 river miles) upstream of the proposed quarry site. The project consists of a fixed crest and gated spillway extending across the river channel and a navigation lock. Construction of the lock and gated spillway was completed in 1969. The pool behind the dam (Claiborne Lake) was raised to approximately 9.4 meters (31 feet) above msl, and navigation through the lock was first permitted on November 15, 1969. Early in December, 1969, the pool was raised to 9.8 meters (32 feet) above msl and was maintained, except for a brief flood period, between 9.8 and 10 meters (32 and 33 feet) until the middle of May, 1970. The fixed crest spillway section was completed in December, 1970.

The Claiborne Lock and Dam has no powerhouse and is primarily a navigation structure. The minimum reservoir level of 9.8 meters (32 feet) provides safe navigation depths to Millers Ferry Lock and Dam. The Claiborne Lock and Dam is operated to re-regulate powerhouse releases from Millers Ferry and to provide navigable depths in the channel downstream from Claiborne. The minimum flow required for a 3-meter (9-foot) channel depth is 241 cms (8,500 cfs). The project also provides for public recreation and for conservation of fish and wildlife (Lucas, 1977). The mean depth of Claiborne Lake is about 5 meters (16 feet), with depths to 12 meters (40 feet) just above the lock and dam.

Systems of stone training dikes have been constructed at 13 locations in the river below Claiborne. These dikes are intended to reduce rates of shoaling in the navigation channel and thus reduce the amount of maintenance dredging required.

In addition to the navigation projects discussed above, numerous flood control projects have been completed in the reaches of the river upstream from Claiborne.

GENERAL OVERVIEW OF IDEAL BASIC INDUSTRIES PROPERTY

The quarry site encompasses 1,633 hectares (4,035 acres) of rolling hills on the eastern side of the Alabama River in Monroe County, Alabama (see Figure B.W.11). At the northern boundary of the property, the Alabama River changes flow direction from southeasterly to almost due south. Marshalls Bluff bounds the eastern shore of the river, and an extensive floodplain has developed along the western shore. Four major streams drain the quarry site: McGirts Creek, Thompson Mill Creek (also known as Marshalls Creek), Hollinger Creek, and Randons Creek. All flow in a generally southwest direction. Four small watersheds exist between McGirts Creek and Hollinger Creek immediately adjacent to the Alabama River. These watersheds are referred to as Alabama River Tributaries Nos. 1, 2, 3, and 4. Table B.W.7 lists the areas of each watershed.

Alabama River

Velocity Profile and Hydraulics at the Gaillard Tract

In June, 1977, river current velocities along a profile perpendicular to flow (at the proposed docking facility) were measured. A Teledyne-Gurley Model 662 current meter was used for the study. Velocities were measured from surface to river bottom at five stations along the profile. Depth soundings were taken concurrently.

The results of the investigation are shown in Figure B.W.12. The distribution of isovels displays sharpest gradients close to the river banks. In addition, the isovels also show the effect of the upstream river basin geometry upon current velocity structure. As the Alabama River courses southward above the quarry site (Figure B.W.11), it makes a sweeping bend so that the convex side faces east. Centrifugal force causes the swiftest currents to occur on the convex side of the bend.

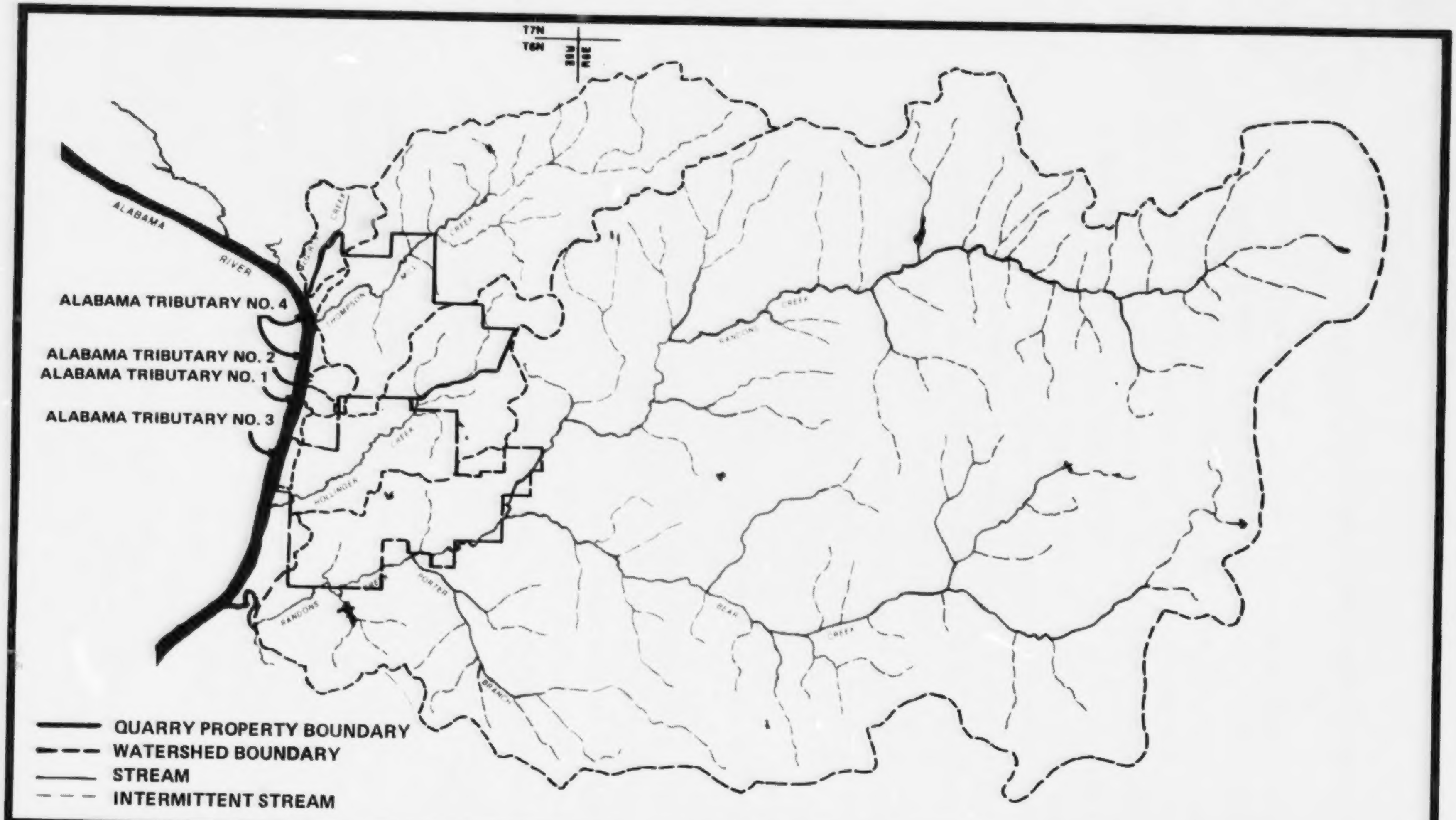
T7N
T6N
R9E
R8E
ALABAMA
RIVER
ALABAMA TRIBUTARY NO. 4
ALABAMA TRIBUTARY NO. 2
ALABAMA TRIBUTARY NO. 1
ALABAMA TRIBUTARY NO. 3
CREEK
THOMPSON
MILL
CREEK
CREEK
HOLLINGER
CREEK
RANDONS
CREEK
RANDONS
PORTER
BRANCH
BEAR
CREEK
QUARRY PROPERTY BOUNDARY
WATERSHED BOUNDARY
STREAM
INTERMITTENT STREAM

Figure B.W.11

WATERSHED MAP: McGIRTS CREEK, THOMPSON MILL CREEK, HOLLINGER CREEK, RANDONS CREEK, ALABAMA TRIBUTARIES 1, 2, 3, AND 4

SOURCE: Environmental Science and Engineering, Inc., 1977.

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Table B.W.7. Watershed Areas

Watershed	Total Area in Watershed (Hectares)	Total Area in Watershed (Acres)	Area in Quarry Property (Hectares)	Area in Quarry Property (Acres)	% Watershed in Quarry Property
McGirts Creek	161	397	30	73	18
Thompson Mill Creek (Marshalls Creek)	1,777	4,392	385	952	22
Alabama No. 4	34	84	34	84	100
Alabama No. 2	42	104	42	104	100
Alabama No. 1	17	42	17	42	100
Hollinger Creek	874	2,160	592	1,462	68
Alabama No. 3	27	68	27	68	100
Randons Creek	14,324	35,394	506	1,251	4
TOTAL		--	1,633	4,035	--

Source: Environmental Science and Engineering, Inc., 1977.

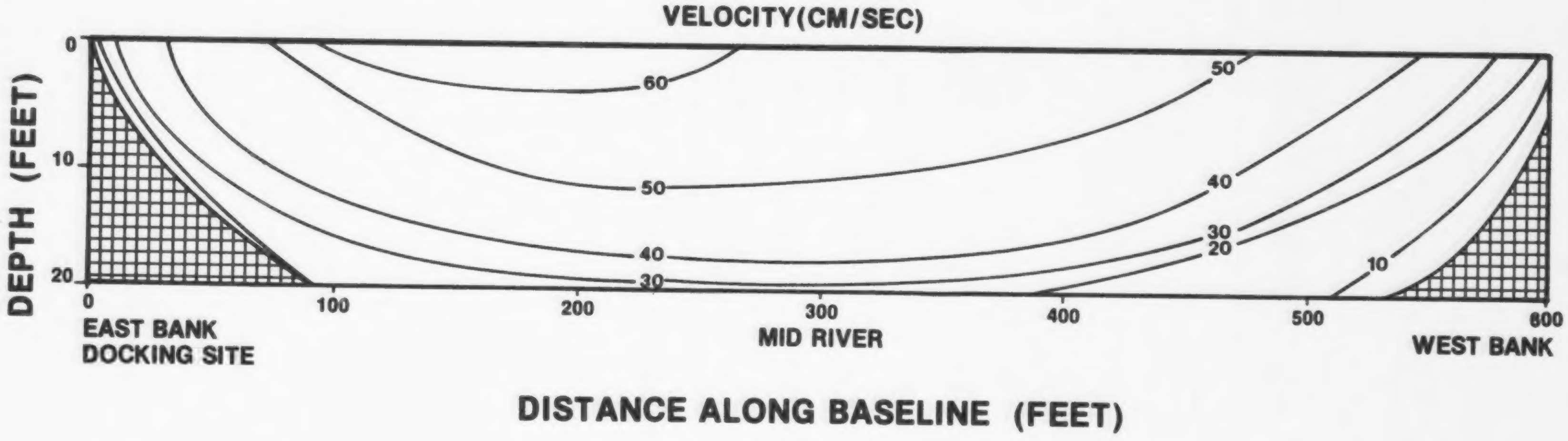

Figure B.W.12
VELOCITY PROFILE ALABAMA RIVER AT PROPOSED DOCKING FACILITY

SOURCE: Environmental Science and Engineering, Inc., 1977.

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The shorelines of the river are highly turbulent zones as evidenced by the relatively steep velocity gradients (see Figure B.W.12). The turbulent nature is compounded by lateral indentations along the river banks and by tree snags which bring about increased turbulence and eddies. The occurrence of eddies is determined by the size and locations of shoreline recesses. Lateral velocity variations such as these are primarily responsible for creating increased longitudinal dispersion rates in rivers (Ward and Espey, 1971). However, small scale features, such as individual eddies, may have poor exchange with the main stream of flow. The water within an eddy may be entrained for a considerable length of time while the turbulence created at its boundaries may enhance dispersion outside the eddy.

The position of the high velocity currents typically indicates the location of the naturally-maintained channel. The high velocity area is nearest the eastern bank and extends to about mid-river. The span of the river over which these swiftest currents flow coincides with an area of coarse pebble gravel river bottom (see Figure B.W.13). The coarse sediments indicate an area of scour or natural maintenance.

Sediments and Depositional Processes

A representative number of river sediment samples between Howard Landing and Randons Creek was collected in June, 1977. Sediments were taken using a ponar grab and were later sieved for grain size distribution (Folk, 1974). The grain size classifications are mapped in Figure B.W.13.

The sediments reflect the energy of the overlying waters. Along the shores, slumping and mass wasting of the banks combine with sluggish flow to deposit medium to muddy sand 6 to 15 meters (20 to 50 feet) from the eastern shore. Sandy gravel extends from here to near mid-river. This coarsest sediment is associated with the high velocity currents of the river. The coarse gravel grades laterally (westward) into a medium quartzose sand. Muddy sand occurs on the western shore

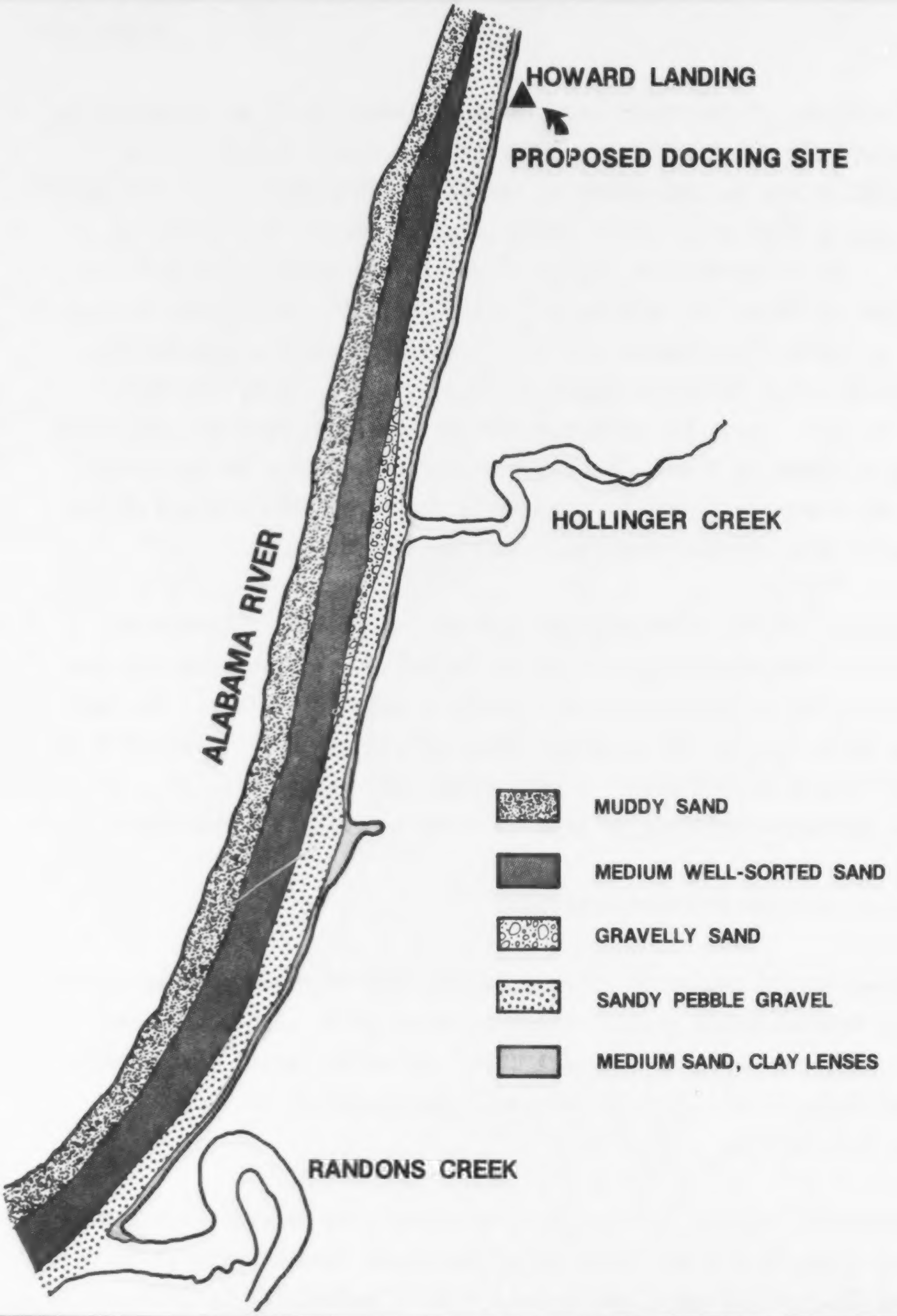
HOWARD LANDING
PROPOSED DOCKING SITE
HOLLINGER CREEK
ALABAMA RIVER
MUDDY SAND
MEDIUM WELL-SORTED SAND
GRAVELLY SAND
SANDY PEBBLE GRAVEL
MEDIUM SAND, CLAY LENSES
RANDONS CREEK

Figure B.W.13
ALABAMA RIVER SEDIMENTS

0 0.5 1
SCALE IN KILOMETERS

SOURCE: Environmental Science and Engineering, Inc., 1977.

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in an energy environment similar to the eastern bank. The gravelly area represents the naturally maintained channel whereas the sandy areas are zones of potential deposition or shoaling.

The deposition of silt and sand along the banks is quite evident in the tributary valleys. An annual alternation of inorganic and organic deposition takes place in portions of stream valleys subject to annual river flooding. During late winter and early spring, the rain-swollen stream valleys are reservoirs of alluvium. During the summer and fall, the exposed stream valleys collect leaves, twigs, and other forest litter. This organic debris is then buried by the succeeding alluvial layer. This cyclic sedimentation takes place not only on the valley floors, but also on low hanging tree limbs and fallen trunks. Periods of intense rainfall and high stream flow may wash away one or more of these layers, thus disrupting the sequence. Sedimentation and stream erosion alternate in these areas so that the small valleys maintain a youthful V-shape while upland areas mature.

Water Level Extremes and Flooding

Flooding of the Alabama River is most likely to occur in the late winter and early spring, whereas low water levels generally occur in the summer and autumn. The highest level recorded for the Alabama River at Claiborne was 16.9 meters (55.6 feet) above msl on March 7, 1961. The discharge associated with that stage was 7,561 cms (267,000 cfs). The U.S. Army Corps of Engineers has identified this event as one with a recurrence interval of approximately 100 years.

Extrapolating the stage elevation from the Claiborne gage downstream to the proposed quarry site, river kilometer 85 (river mile 53) yields a 100-year stage elevation at the site approximately 14 meters (47 feet) above msl. Figure B.W.14 shows the 100-year floodplain at the site as prepared by the U.S. Geological Survey. The floodplain generally follows the 12-meter (40-foot) msl contour line.

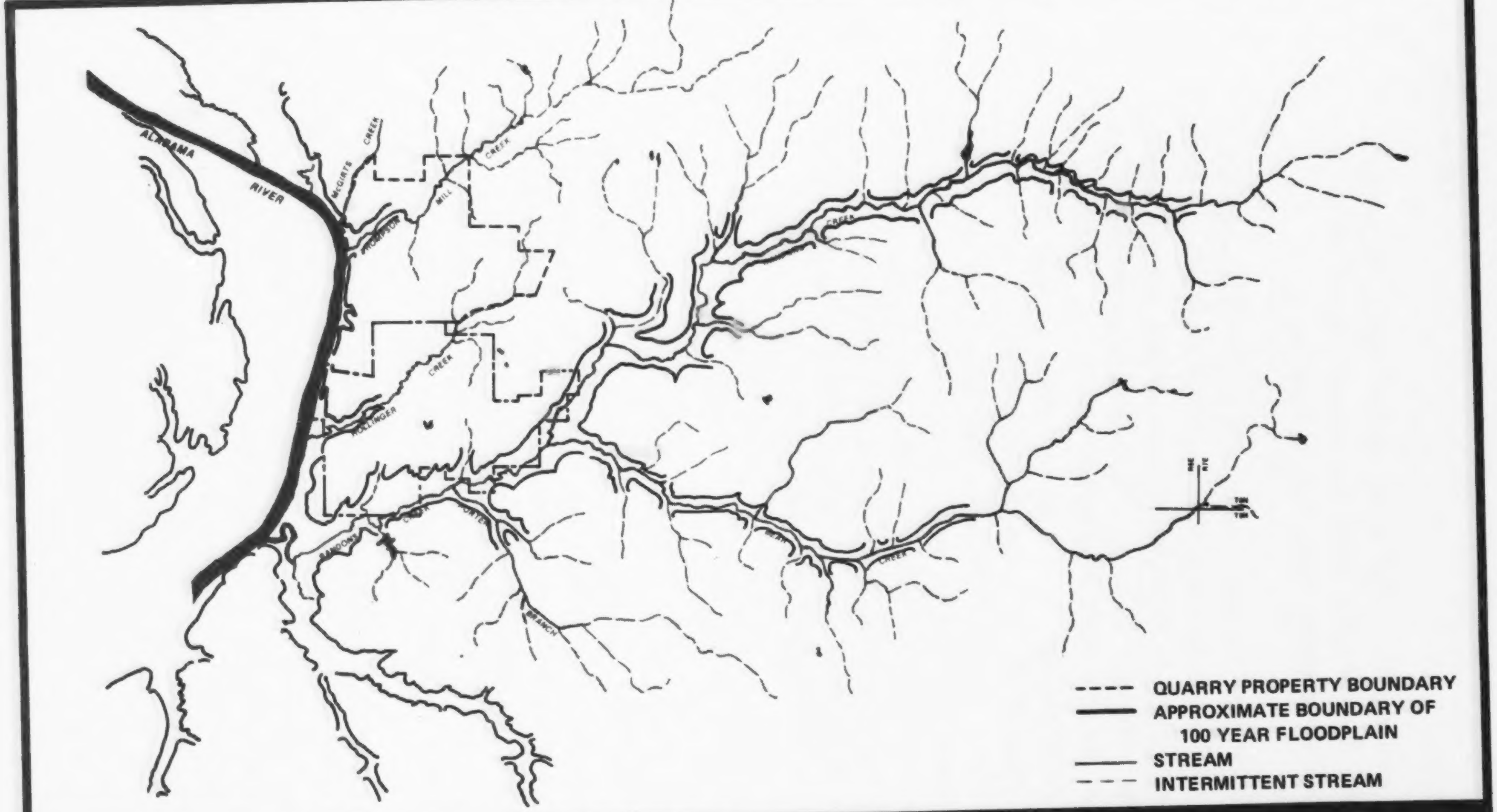
ALABAMA
RIVER
McGIRTS
CREEK
MILL
CREEK
THOMPSON
CREEK
HOLLINGER
CREEK
RANDONS
CREEK
PORTER
BRANCH
CREEK
QUARRY PROPERTY BOUNDARY
APPROXIMATE BOUNDARY OF 100 YEAR FLOODPLAIN
STREAM
INTERMITTENT STREAM
0
2
SCALE IN KILOMETERS
N

Figure B.W.14
100-YEAR FLOODPLAIN AT PROPOSED QUARRY SITE

SOURCE: USGS, 1972.
Flood Prone Area Map: Flynns Lake, Alabama, and Frisco City, Alabama.

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Another storm, which occurred in April, 1976, has been identified by the U.S. Army Corps of Engineers as one with a recurrence interval of approximately 10 years. This storm produced a stage elevation at the Claiborne gage of approximately 15 meters (50 feet) above msl. Downstream at the quarry site, the stage elevation produced by this storm was estimated to be 13 meters (42 feet) above msl. Projected stage elevations at the quarry site for various hydrologic events are summarized in Table B.W.8.

The discharge associated with various flood events at points on the Alabama River varies according to drainage area and storm magnitude. Figure B.W.15 shows the variation of flood discharge with drainage area for selected recurrence intervals.

Mean low water elevations have been estimated by the U.S. Army Corps of Engineers for various sites along the Alabama River. By utilizing these values, the mean low water elevation at the quarry site was estimated to be 2.9 meters (9.5 feet) above msl. Low flows at the Claiborne gaging station have been recorded by the Geological Survey of Alabama and are presented in Table B.W.9. The minimum 7-day low flow at Claiborne was 158 cms (5,570 cfs) compared to the average flow of the river at that point of 922 cms (32,540 cfs). The estimated median 7-day low flow is 252 cms (8,900 cfs).

Water Quality

The quality of Alabama River water is highly variable and is strongly influenced by river flow, rainfall, and season. Historical flow and water quality data collected at a USGS station operated at Claiborne, Alabama (see Table B.W.10) and water quality data collected by Environmental Science and Engineering, Inc., at the proposed quarry site docking facility (see Table B.W.11) are plotted against time (October, 1973, to September, 1974) in Figure B.W.16. Figure B.W.17 shows the locations of the Environmental Science and Engineering, Inc. sampling stations at the quarry site.

Table B.W.8. Stage Elevations on the Alabama River

	Stage Elevation msl at Claiborne Gage River Kilometer (River Mile 76)		Stage Elevation msl at Quarry Site (Projected) River Kilometer 82 (River Mile 53)	
Event	meters	(feet)	meters	(feet)
100-year	16.9	(55.6)	14.4	(47.4)
10-year	15.2	(50.0)	12.9	(42.4)
Mean Low Water	3.8	(12.5)	2.9	(9.5)

Sources: Environmental Science and Engineering, Inc., 1977.
Kerr, 1977.

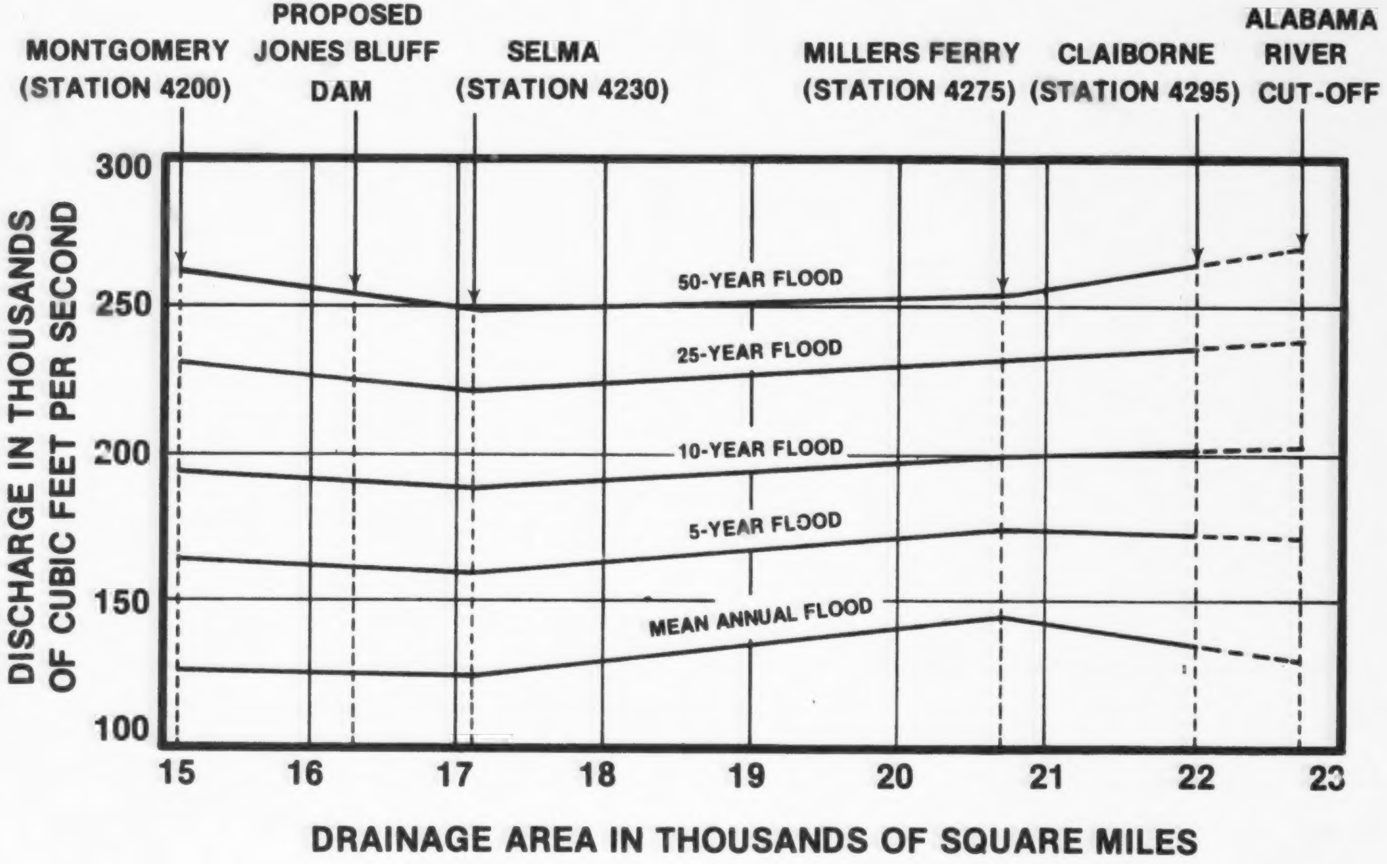

Figure B.W.15
VARIATION OF FLOOD-DISCHARGE WITH DRAINAGE AREA FOR SELECTED RECURRENCE INTERVALS, ALABAMA RIVER

SOURCE: Gambel, 1965.

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Table B.W.9. Minimum Average Flows and Median 7-Day Low Flows for the Alabama River at Claiborne

	Drainage Area Sq. Km. (Sq. Mi.)	Period of Record	Lowest Mean Flow, in cfs, for Indicated Number of Consecutive Days During Period of Record							Estimated 7-Day Low 1939-61 cfs
			1	7	15	30	60	120	Year Of Occurrence	
Alabama River at Claiborne	56,980 (22,000)	1930-61	4,840	5,570	6,000	6,090	6,420	6,870	1954	8,900

Source: Pierce, 1966.

Table B.W.10. Water Quality Data, Alabama River at Claiborne, Alabama, October, 1971 to September, 1974

MOBILE RIVER BASIN

02429500 ALABAMA RIVER AT CLAIBORNE, Ala.
(International Hydrological Decade River Station)

LOCATION.--Lat 31°32'48", long 87°30'45", in sec. 25, T. 7 N., R. 5 E., Monroe County, at gaging station near left bank on downstream side of bridge on U.S. Highway 84 at Claiborne, 0.5 mile downstream from Limestone Creek, 12 miles west of Monroeville, and at mile 76.1.

DRAINAGE AREA.--22,000 sq mi, approximately.

PERIOD OF RECORD.--Chemical analyses: March 1966 to September 1968 (daily), October 1969 to September 1972 (monthly).
Water temperatures: March 1966 to September 1968.

REMARKS.--Miscellaneous samples of chemical data published for water year 1965.

CHEMICAL ANALYSES, WATER YEAR OCTOBER 1971 TO SEPTEMBER 1972

DATE	DISCHARGE (CFS)	DISSOLVED SILICA (SIO2) (MG/L)	DISSOLVED IRON (FE) (UG/L)	DISSOLVED MANGANESE (MN) (UG/L)	DISSOLVED CALCIUM (CA) (MG/L)	DISSOLVED MAGNESIUM (MG) (MG/L)	DISSOLVED SODIUM (NA) (MG/L)	DISSOLVED POTASSIUM (K) (MG/L)	DISSOLVED SULFATE (SO4) (MG/L)
OCT. 06...	13100	4.7	60	10	11	3.1	6.0	1.5	7.0
NOV. 04...	11300	7.2	170	30	9.2	2.6	6.4	1.4	5.6
DEC. 09...	84700	5.8	100	10	15	2.3	3.8	2.2	6.6
JAN. 17...	160000	6.0	130	20	9.1	1.9	2.6	1.1	5.8
FEB. 09...	93600	4.7	140	--	12	1.8	2.5	1.4	7.6
MAR. 30...	39300	6.4	200	60	10	2.6	3.8	1.1	7.0
APR. 27...	17800 .	4.0	110	80	11	2.9	4.2	1.2	6.0
JUNE 08...	24300	3.0	0	3	13	3.6	5.4	1.4	7.4
JULY 20...	18900	--	--	--	--	--	--	--	--
AUG. 24...	10700	--	--	--	--	--	--	--	--
SEP. 12...	11500	5.7	70	11	9.8	3.2	6.4	1.6	3.4

DATE	DISSOLVED CHLORIDE (CL) (MG/L)	DISSOLVED FLUORIDE (F) (MG/L)	ORGANIC NITROGEN (N) (MG/L)	DISSOLVED NITRITE (N) (MG/L)	DISSOLVED NITRATE (N) (MG/L)	TOTAL NITRATE (N) (MG/L)	TOTAL PHOSPHORUS (P) (MG/L)	DISSOLVED SOLIDS (RESIDUE AT 180 C) (MG/L)	DISSOLVED SOLIDS (SUM OF CONSTITUENTS) (MG/L)
OCT. 06...	5.7	.1	--	--	.05	--	--	65	63
NOV. 04...	6.4	.1	--	--	.05	--	--	71	59
DEC. 09...	4.4	.2	--	--	.07	--	--	84	70
JAN. 17...	2.9	.1	--	--	.2	--	--	50	44
FEB. 09...	2.6	.1	--	--	.2	--	--	58	53
MAR. 30...	3.6	.1	--	--	.3	--	--	66	56
APR. 27...	4.0	.0	--	--	.2	--	--	57	57
JUNE 08...	5.1	.1	--	--	.1	--	--	70	65
JULY 20...	--	--	--	--	.2	--	.020	--	--
AUG. 24...	--	--	--	--	--	.1	.050	--	--
SEP. 12...	7.0	.1	.22	.002	.05	--	.050	64	57

Table B.W.10. Water Quality Data, Alabama River at Claiborne, Alabama, October, 1971 to September, 1974 (Continued, page 2 of 8)

MOBILE RIVER BASIN

02429500 ALABAMA RIVER AT CLAIBORNE, ALA.--Continued
(International Hydrological Decade River Station)

CHEMICAL ANALYSES, WATER YEAR OCTOBER 1971 TO SEPTEMBER 1972--Continued

DATE	DIS-SOLVED SOLIDS (TONS PER AC-FT)	HARD-NESS (CA,MG) (MG/L)	NON-CAR-BONATE HARD-NESS (MG/L)	SODIUM AD-SORP-TION RATIO	CHEM-ICAL OXYGEN DEMAND (LOW LEVEL) (MG/L)	BIO-CHEM-ICAL OXYGEN DEMAND (MG/L)	FECAL COLI-FORM (COL. PER 100 ML)	IMME-DIATE COLI-FORM (COL. PER 100 ML)	TOTAL ARSENIC (AS) (UG/L)
OCT. 06...	.09	41	2	.4	--	.2	8	130	--
NOV. 04...	.10	34	1	.5	--	.8	31	530	--
DEC. 09...	.11	47	3	.2	--	2.0	1800	14000	--
JAN. 17...	.07	31	7	.2	--	1.4	140	3900	--
FEB. 09...	.08	38	6	.2	--	2.4	670	9700	--
MAR. 30...	.09	36	3	.3	--	1.2	--	1100	--
APR. 27...	.08	40	3	.3	--	1.2	--	1500	--
JUNE 08...	.10	48	4	.3	--	.7	--	1000	--
JULY 20...	--	--	--	--	7	--	8	170	--
AUG. 24...	--	--	--	--	10	--	9	900	--
SEP. 12...	.09	38	5	.5	11	1.1	11	250	6

FIELD ANALYSES

DATE	DIS-CHARGE (CFS)	BICAR-BONATE (HCO3) (MG/L)	CAR-BONATE (CO3) (MG/L)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	(UNITS)	TEMPER-ATURE (DEG C)	DIS-SOLVED OXYGEN (MG/L)
OCT. 06...	--	48	0	118	7.0	27.0	9.2
21...	7780	--	--	--	--	23.0	--
NOV. 04...	--	41	0	107	7.2	22.0	9.0
DEC. 09...	--	54	0	122	7.4	12.0	8.9
JAN. 17...	--	29	0	73	6.6	11.0	9.6
FEB. 09...	--	39	0	86	7.0	9.0	11.8
MAR. 30...	--	48	0	95	7.2	15.5	10.2
APR. 27...	--	46	0	101	7.2	20.5	9.6
JUNE 08...	--	54	0	121	7.4	26.0	8.4
JULY 20...	--	41	0	99	7.2	29.5	9.2
AUG. 24...	--	40	0	96	7.2	29.5	8.6
SEP. 12...	--	40	0	180	7.1	29.5	9.0

RADIOCHEMICAL ANALYSES

DATE	DIS-SOLVED GROSS ALPHA AS U-NAT. (UG/L)	SUS-PENDED GROSS ALPHA AS U-NAT. (UG/L)	DIS-SOLVED GROSS BETA AS SR90 /Y90 (PC/L)	DIS-SOLVED GROSS BETA AS CS-137 (PC/L)	SUS-PENDED GROSS BETA AS SR90 /Y90 (PC/L)	DIS-SOLVED RA-226 (PLAN-CHET COUNT) (PC/L)	DIS-SOLVED RA-226 (RADON METHOD) (PC/L)	DIS-SOLVED URANIUM (U) (UG/L)
NOV. 04...	1.8	.9	2.6	3.3	.6	--	.03	.06
JAN. 17...	1.2	5.2	2.6	3.3	2.9	--	.02	.06
AUG. 24...	<.4	.6	2.0	2.5	.6	<.1	--	.01

Table B.W.10. Water Quality Data, Alabama River at Claiborne, Alabama, October, 1971 to September, 1974 (Continued, page 3 of 8)

MOBILE RIVER BASIN

02429500 ALABAMA RIVER AT CLAIBORNE, ALA.
(International Hydrological Decade River Station)

ATION.--Lat 31°32'48", long 87°30'45", in sec. 25, T. 7 N., R. 5 E., Monroe County, at gaging station near left bank on downstream side of bridge on U.S. Highway 84 at Claiborne, 0.5 mile (0.8 km) downstream from Limestone Creek, 12 miles (19 km) west of Monroeville, and at mile 76.1 (122.4 km).

DRAINAGE AREA.--22,000 mi^2 (57,000 km^2), approximately.

PERIOD OF RECORD.--Chemical analyses: March 1966 to September 1968 (daily), October 1969 to September 1973 (monthly). Water temperatures: March 1966 to September 1968.

REMARKS.--Miscellaneous samples of chemical data published for water year 1965.

CHEMICAL ANALYSES, WATER YEAR OCTOBER 1972 TO SEPTEMBER 1973

DATE	INSTAN-TANEOUS DIS-CHARGE (CFS)	DIS-SOLVED SILICA (SIO2) (MG/L)	TOTAL IRON (FE) (UG/L)	DIS-SOLVED IRON (FE) (UG/L)	DIS-SOLVED MAN-GANESE (MN) (UG/L)	DIS-SOLVED CAL-CIUM (CA) (MG/L)	DIS-SOLVED MAG-NE-SIUM (MG) (MG/L)	DIS-SOLVED SODIUM (NA) (MG/L)	DIS-SOLVED PO-TAS-SIUM (K) (MG/L)	BICAR-BONATE (HCO3) (MG/L)
OCT. 19...	7260	--	--	--	--	--	--	--	--	--
DEC. 01...	15800	4.8	--	60	28	13	3.9	8.6	2.0	--
JAN. 12...	113000	--	--	260	--	--	--	--	--	--
FEB. 01...	49900	7.1	--	380	10	8.7	2.6	3.3	1.4	--
MAR. 01...	27400	7.0	--	290	30	9.4	2.7	3.5	1.3	--
APR. 03...	136000	5.8	--	220	20	12	1.8	2.2	1.6	--
13...	132000	6.7	--	160	0	7.9	1.7	2.7	1.4	--
MAY 15...	84600	6.0	260	210	40	8.5	1.7	2.6	1.5	--
JULY 06...	18100	7.2	--	450	10	11	2.3	3.8	1.6	--
AUG. 07...	8050	6.1	--	110	52	10	2.9	4.5	1.8	43
SEP. 05...	7490	6.4	--	200	40	10	3.0	5.9	1.8	48

DATE	CAR-BONATE (CO3) (MG/L)	DIS-SOLVED SULFATE (SO4) (MG/L)	DIS-SOLVED CHLO-RIDE (CL) (MG/L)	DIS-SOLVED FLUO-RIDE (F) (MG/L)	TOTAL NITRATE (N) (MG/L)	DIS-SOLVED NITRATE (N) (MG/L)	TOTAL NITRITE (N) (MG/L)	AMMONIA NITRO-GEN (N) (MG/L)	ORGANIC NITRO-GEN (N) (MG/L)
OCT. 19...	--	--	--	--	.2	--	--	--	--
DEC. 01...	--	9.2	7.4	.1	.2	--	--	--	--
JAN. 12...	--	8.8	--	--	.2	--	.015	--	.47
FEB. 01...	--	8.2	3.6	.2	.4	--	.009	--	.40
MAR. 01...	--	7.4	3.4	.4	.2	--	--	--	--
APR. 03...	--	5.2	2.8	.2	.4	--	--	.02	.45
13...	--	6.2	2.4	.2	.2	--	.012	.04	.19
MAY 15...	--	5.4	2.0	.2	.2	--	.003	.04	.27
JULY 06...	--	6.6	3.4	.1	.4	--	--	--	.26
AUG. 07...	0	6.8	4.6	.1	--	.20	.037	--	.20
SEP. 05...	0	6.8	2.2	.1	.2	--	.000	--	.30

Table B.W.10. Water Quality Data, Alabama River at Claiborne, Alabama, October, 1971 to September, 1974 (Continued, page 4 of 8)

MOBILE RIVER BASIN

02429500 ALABAMA RIVER AT CLAIBORNE, ALA.—Continued

CHEMICAL ANALYSES, WATER YEAR OCTOBER 1972 TO SEPTEMBER 1973--Continued

DATE	TOTAL KJELDAHL NITROGEN (N) (MG/L)	TOTAL PHOSPHORUS (P) (MG/L)	DISSOLVED ORTHO. PHOSPHORUS (P) (MG/L)	DISSOLVED SOLIDS (RESIDUE AT 180 C) (MG/L)	DISSOLVED SOLIDS (SUM OF CONSTITUENTS) (MG/L)	DISSOLVED SOLIDS (TONS PER AC-FT)	HARDNESS (CA,MG) (MG/L)	NON-CARBONATE HARDNESS (MG/L)	SODIUM ADSORPTION RATIO
OCT. 19...	--	.052	--	--	--	--	--	--	--
DEC. 01...	--	.059	--	74	79	.10	49	1	.5
JAN. 12...	--	.17	--	70	--	.10	--	--	--
FEB. 01...	--	.075	--	59	54	.08	32	4	.3
MAR. 01...	--	.042	--	55	55	.07	35	4	.3
APR. 03...	--	.078	--	50	51	.07	37	8	.2
13...	.19	.11	--	50	43	.07	27	6	.2
MAY 15...	.34	.12	--	44	44	.06	28	3	.2
JULY 06...	--	.08	--	55	57	.07	37	6	.3
AUG. 07...	--	.11	.007	57	59	.08	37	2	.3
SEP. 05...	--	.082	--	74	61	.10	38	0	.4

DATE	SPECIFIC CONDUCTANCE (MICROMHOS)	PH (UNITS)	TURBIDITY (JTU)	CHEMICAL OXYGEN DEMAND (LOW LEVEL) (MG/L)	BIOCHEMICAL OXYGEN DEMAND (MG/L)	IMMEDIATE COLIFORM (COL. PER 100 ML)	FECAL COLIFORM (COL. PER 100 ML)	STREPTOCOCCI (COLONIES PER 100 ML)	TOTAL ORGANIC CARBON (C) (MG/L)
OCT. 19...	--	--	--	19	.7	530	12	--	--
DEC. 01...	--	--	--	19	--	630	30	--	--
JAN. 12...	--	--	--	12	2.7	11000	730	--	--
FEB. 01...	--	--	24	13	--	2000	70	47	--
MAR. 01...	--	--	--	20	1.6	270	10	3	--
APR. 03...	--	--	60	22	1.3	1800	750	740	--
13...	--	--	35	6	1.2	800	110	--	--
MAY 15...	--	--	35	20	.8	2600	52	16	--
JULY 06...	--	--	17	6	--	700	11	29	--
AUG. 07...	100	7.8	--	4	2.6	690	74	180	52
SEP. 05...	--	7.0	9	20	1.4	210	120	28	--

DATE	TOTAL IRON IN BOTTOM DEPOSITS (UG/G)	TOTAL MANGANESE IN BOTTOM DEPOSITS (UG/G)	TOTAL NITRITE PLUS NITRATE IN BOT. DEP. (MG/KG)	TOTAL PHOSPHORUS IN BOTTOM DEPOSITS (MG/KG)	ORGANIC CARBON IN BED MATERIAL (C) (G/KG)	TOTAL ARSENIC (AS) (UG/L)	TOTAL ARSENIC IN BOTTOM DEPOSITS (UG/G)	TOTAL CADMIUM (CD) (UG/L)	DISSOLVED CADMIUM (CD) (UG/L)	TOTAL CADMIUM IN BOTTOM DEPOSITS (UG/G)	TOTAL CHROMIUM (CR) (UG/L)
OCT. 19...	--	--	--	--	--	5	--	0	--	--	0
JAN. 12...	--	--	--	--	--	5	--	0	--	--	20
APR. 13...	--	--	--	--	--	9	--	0	--	--	0
MAY 15...	--	--	--	--	--	4	--	3	1	--	0
AUG. 07...	650	64	.0	18	.3	--	2	<10	1	0	0
SEP. 05...	--	--	--	--	--	5	--	<10	0	--	0

Table B.W.10. Water Quality Data, Alabama River at Claiborne, Alabama, October, 1971 to September, 1974 (Continued, page 5 of 8)

MOBILE RIVER BASIN

02429500 ALABAMA RIVER AT CLAIBORNE, ALA.--Continued

CHEMICAL ANALYSES, WATER YEAR OCTOBER 1972 TO SEPTEMBER 1973--Continued

DATE	DISSOLVED CHROMIUM (CR) (UG/L)	TOTAL CHROMIUM IN BOTTOM DEPOSITS (UG/G)	HEXAVALENT CHROMIUM (CR6) (UG/L)	TOTAL COBALT (CO) (UG/L)	DISSOLVED COBALT (CO) (UG/L)	TOTAL COBALT IN BOTTOM DEPOSITS (UG/G)	TOTAL COPPER (CU) (UG/L)	DISSOLVED COPPER (CU) (UG/L)	TOTAL COPPER IN BOTTOM DEPOSITS (UG/G)	TOTAL LEAD (PB) (UG/L)	DISSOLVED LEAD (PB) (UG/L)
OCT. 19...	--	--	--	--	--	--	--	--	--	5	--
JAN. 12...	--	--	--	--	--	--	--	--	--	2	--
APR. 13...	--	--	--	--	--	--	--	--	--	1	--
MAY 15...	0	--	0	1	0	--	10	0	--	14	2
AUG. 07...	0	2	--	<25	0	<2	20	20	1	<50	10
SEP. 05...	0	--	--	<25	0	--	10	9	--	<50	10

DATE	TOTAL LEAD IN BOTTOM DEPOSITS (UG/G)	TOTAL MERCURY (HG) (UG/L)	DISSOLVED MERCURY (HG) (UG/L)	TOTAL MERCURY IN BOTTOM DEPOSITS (UG/G)	TOTAL SELENIUM (SE) (UG/L)	DISSOLVED SELENIUM (SE) (UG/L)	TOTAL SELENIUM IN BOTTOM DEPOSITS (UG/G)	TOTAL ZINC (ZN) (UG/L)	DISSOLVED ZINC (ZN) (UG/L)	TOTAL ZINC IN BOTTOM DEPOSITS (UG/G)
OCT. 19...	--	.0	--	--	--	--	--	0	--	--
JAN. 12...	--	.0	--	--	--	--	--	0	--	--
APR. 13...	--	.0	--	--	--	--	--	0	--	--
MAY 15...	--	.1	.0	--	1	1	--	10	10	--
AUG. 07...	<5	.0	.0	.0	--	--	.5	20	0	5
SEP. 05...	--	.0	.0	--	--	--	--	60	0	--

RADIOCHEMICAL ANALYSES

DATE	DISSOLVED GROSS ALPHA AS U-NAT. (UG/L)	SUSPENDED GROSS ALPHA AS U-NAT. (UG/L)	DISSOLVED GROSS BETA AS CS-137 (PC/L)	SUSPENDED GROSS BETA AS CS-137 (PC/L)	DISSOLVED GROSS BETA AS SR90 /Y90 (PC/L)	SUSPENDED GROSS BETA AS SR90 /Y90 (PC/L)	DISSOLVED RA-226 (RADON METHOD) (PC/L)	DISSOLVED URANIUM (U) (UG/L)
APR. 03...	1.1	7.7	2.6	4.2	2.1	3.8	.03	.04
SEP. 05...	<.5	2.5	2.8	1.4	2.3	1.2	.04	.03

FIELD ANALYSES

DATE	INSTANTANEOUS DISCHARGE (CFS)	BICARBONATE (HCO3) (MG/L)	CARBONATE (CO3) (MG/L)	SPECIFIC CONDUCTANCE (MICROMHOS)	PH (UNITS)	TEMPERATURE (DEG C)	DISSOLVED OXYGEN (MG/L)
OCT. 19...	--	47	0	112	6.9	24.0	8.7
NOV. 21...	16600	--	--	--	--	16.0	--
DEC. 01...	--	58	0	142	7.2	13.0	12.1
JAN. 12...	--	38	0	90	7.1	8.5	11.3
FEB. 01...	--	25	0	100	7.0	9.5	--
MAR. 01...	--	38	0	92	7.4	11.0	11.8
APR. 03...	--	36	0	81	7.3	16.0	8.2
13...	--	26	0	70	7.5	16.0	9.2
MAY 15...	--	31	0	70	7.4	21.0	8.1
JULY 06...	--	38	0	95	6.5	29.0	8.3
AUG. 07...	--	--	--	--	--	30.0	8.8
SEP. 05...	--	--	--	112	--	30.0	--

Table B.W.10. Water Quality Data, Alabama River at Claiborne, Alabama, October, 1971 to September, 1974 (Continued, page 6 of 8)

MOBILE RIVER BASIN

02429500 ALABAMA RIVER AT CLAIBORNE, ALA.
(International Hydrological Decade (IHD) station and National
stream-quality accounting network station)

LOCATION.--Lat 31°32'48", long 87°30'45", in sec. 25, T. 7 N., R. 5 E., Monroe County, at gaging station near left bank on downstream side of bridge on U.S. Highway 84 at Claiborne, 0.5 mile (0.8 km) downstream from Limestone Creek, 12 miles (19 km) west of Monroeville, and at mile 76.1 (122.4 km).

DRAINAGE AREA.--22,000 mi² (57,000 km²), approximately.

PERIOD OF RECORD.--Chemical analyses: March 1966 to September 1968 (daily), October 1969 to September 1974 (monthly).
Water temperatures: March 1966 to September 1968, May to September 1974.

REMARKS.--Miscellaneous samples of chemical data published for water year 1965. No specific conductance or temperature data for some days due to recorder malfunction.

CHEMICAL ANALYSES, WATER YEAR OCTOBER 1973 TO SEPTEMBER 1974

DATE	INSTANTANEOUS DISCHARGE (CFS)	DISSOLVED SILICA (SIO2) (MG/L)	TOTAL IRON (FE) (UG/L)	DISSOLVED IRON (FE) (UG/L)	SUSPENDED MANGANESE (MN) (UG/L)	TOTAL MANGANESE (MN) (UG/L)	DISSOLVED MANGANESE (MN) (UG/L)	DISSOLVED CALCIUM (CA) (MG/L)	DISSOLVED MAGNESIUM (MG) (MG/L)	DISSOLVED SODIUM (NA) (MG/L)	DISSOLVED POTASSIUM (K) (MG/L)	BICARBONATE (HCO3) (MG/L)
OCT. 16...	6700	6.1	--	--	--	--	--	11	2.9	6.7	1.5	48
NOV. 15...	11000	5.7	--	--	--	--	--	11	4.5	8.3	1.7	57
DEC. 12...	20500	7.0	--	--	--	--	--	11	4.2	11	3.0	56
JAN. 24...	79000	7.1	--	--	--	--	--	12	2.1	2.9	1.5	38
FEB. 14...	70100	7.7	--	--	--	--	--	12	2.3	2.9	1.6	40
MAR. 06...	35000	7.1	--	--	--	--	--	9.5	2.2	3.7	1.9	41
APR. 16...	106000	6.2	--	--	--	--	--	13	2.5	2.9	1.4	43
MAY 17...	17600	6.3	--	--	--	--	--	11	2.4	4.0	1.4	42
JUNE 19...	16400	6.8	850	90	46	63	17	14	2.5	4.6	1.5	47
JULY 23...	13000	5.3	--	--	--	--	--	11	2.8	5.6	1.4	41
AUG. 20...	14700	6.1	--	--	--	--	--	13	3.0	5.5	1.6	48
SEP. 19...	16000	6.9	390	120	20	20	0	11	2.8	5.6	1.6	45

DATE	CARBONATE (CO3) (MG/L)	DISSOLVED SULFATE (SO4) (MG/L)	DISSOLVED CHLORIDE (CL) (MG/L)	DISSOLVED FLUORIDE (F) (MG/L)	TOTAL NITRATE (N) (MG/L)	DISSOLVED NITRATE (N) (MG/L)	TOTAL NITRITE (N) (MG/L)	DISSOLVED NITRITE (N) (MG/L)	TOTAL NITRITE PLUS NITRATE (N) (MG/L)	DISSOLVED NITRITE PLUS NITRATE (N) (MG/L)	TOTAL KJELDAHL NITROGEN (N) (MG/L)
OCT. 16...	0	7.7	7.0	.2	.37	.27	.00	.00	.37	.27	.34
NOV. 15...	0	7.6	5.7	.0	--	--	--	--	.23	--	.06
DEC. 12...	0	8.4	6.8	.2	--	--	--	--	.09	--	.38
JAN. 24...	0	7.6	3.4	.1	--	--	--	--	.24	--	.11
FEB. 14...	0	6.9	4.1	.1	--	--	--	--	.31	--	.33
MAR. 06...	0	5.8	3.5	.1	.35	--	.00	.00	.35	--	--
APR. 16...	0	7.0	5.0	.1	--	--	--	--	.26	--	.24
MAY 17...	0	6.0	3.7	.2	--	--	--	--	.29	--	.21
JUNE 19...	0	6.4	5.2	.2	--	--	--	--	.25	--	.38
JULY 23...	0	6.5	5.6	.2	--	--	--	--	.13	--	.52
AUG. 20...	0	6.0	4.3	.8	--	--	--	--	.28	--	.38
SEP. 19...	0	6.1	3.5	.1	--	--	--	--	2.1	--	.64

Table B.W.10. Water Quality Data, Alabama River at Claiborne, Alabama, October, 1971 to September, 1974 (Continued, page 7 of 8)

MOBILE RIVER BASIN

02429500 ALABAMA RIVER AT CLAIBORNE, ALA.--Continued

CHEMICAL ANALYSES, WATER YEAR OCTOBER 1973 TO SEPTEMBER 1974--Continued

DATE	TOTAL NITROGEN (N) (MG/L)	TOTAL PHOSPHORUS (P) (MG/L)	DISSOLVED SOLIDS (RESIDUE AT 180 C) (MG/L)	DISSOLVED SOLIDS (SUM OF CONSTITUENTS) (MG/L)	DISSOLVED SOLIDS (TONS PER DAY)	HARDNESS (CA,MG) (MG/L)	NONCARBONATE HARDNESS (MG/L)	SODIUM ADSORPTION RATIO	SPECIFIC CONDUCTANCE (MICROMHOS)	PH (UNITS)	TEMPERATURE (DEG C)
OCT. 16...	.71	.07	78	68	1410	39	0	.5	114	7.7	26.0
NOV. 15...	.29	.06	75	73	2230	46	0	.5	133	7.5	18.0
DEC. 12...	.47	.02	69	79	4930	45	0	.7	135	7.6	13.0
JAN. 24...	.35	.05	60	55	12800	39	7	.2	90	6.9	13.0
FEB. 14...	.64	.08	68	57	12900	39	7	.2	97	7.3	11.0
MAR. 06...	--	.06	58	54	5480	33	0	.3	91	7.3	13.0
APR. 16...	.50	.09	64	59	18300	43	7	.2	94	7.0	18.0
MAY 17...	.50	.06	--	58	2760	37	3	.3	114	7.3	24.0
JUNE 19...	.63	.04	71	64	3140	45	6	.3	110	7.6	27.0
JULY 23...	.65	.05	84	59	2950	39	5	.4	111	7.3	30.0
AUG. 20...	.66	.08	80	64	3180	45	5	.4	110	7.3	29.0
SEP. 19...	2.7	.06	81	60	3500	39	2	.4	107	7.1	26.5

DATE	TURBIDITY (JTU)	DISSOLVED OXYGEN (MG/L)	BIOCHEMICAL OXYGEN DEMAND (MG/L)	TOTAL PHYTOPLANKTON (CELLS PER ML)	IMMEDIATE COLIFORM (COL. PER 100 ML)	FECAL COLIFORM (COL. PER 100 ML)	STREPTOCOCCI (COLONIES PER 100 ML)	TOTAL ORGANIC CARBON (C) (MG/L)	TOTAL SED. SIEVE DIAM. % FINER THAN .062 MM	SUSPENDED SEDIMENT (MG/L)	SUSPENDED SEDIMENT DISCHARGE (T/DAY)
OCT. 16...	20	8.1	.8	25	600	2	70	--	--	--	--
NOV. 15...	30	11.4	2.0	--	240	13	18	--	--	28	832
DEC. 12...	20	11.8	1.6	130	340	92	8	--	37	18	996
JAN. 24...	50	10.8	1.8	80	2700	484	390	--	66	84	17900
FEB. 14...	20	11.2	--	240	970	85	100	--	44	135	25600
MAR. 06...	20	10.4	1.0	--	--	100	5	--	--	--	--
APR. 16...	50	10.6	4.3	200	2100	170	260	--	--	128	36600
MAY 17...	180	9.5	4.8	100	35	8	3	--	--	70	3330
JUNE 19...	100	8.3	1.9	650	2300	940	150	4.9	--	117	5180
JULY 23...	10	10.2	--	3700	420	7	2	--	--	42	1470
AUG. 20...	20	10.4	--	320	310	2	17	--	--	117	4640
SEP. 19...	20	11.0	--	430	370	16	7	4.1	--	30	1300

DATE	TOTAL ARSENIC (AS) (UG/L)	SUSPENDED ARSENIC (AS) (UG/L)	DISSOLVED ARSENIC (AS) (UG/L)	TOTAL CADMIUM (CD) (UG/L)	SUSPENDED CADMIUM (CD) (UG/L)	DISSOLVED CADMIUM (CD) (UG/L)	TOTAL CHROMIUM (CR) (UG/L)	SUSPENDED CHROMIUM (CR) (UG/L)	DISSOLVED CHROMIUM (CR) (UG/L)
JUNE 19...	0	0	0	2	1	1	0	0	0
SEP. 19...	1	0	1	1	0	1	<10	<10	0

Table B.W.10. Water Quality Data, Alabama River at Claiborne, Alabama, October, 1971 to September, 1974 (Continued, page 8 of 8)

MOBILE RIVER BASIN

02429500 ALABAMA RIVER AT CLAIBORNE, ALA.--Continued

CHEMICAL ANALYSES, WATER YEAR OCTOBER 1973 TO SEPTEMBER 1974-Continued

DATE	TOTAL COBALT (CO) (UG/L)	SUS-PENDED COBALT (CO) (UG/L)	DIS-SOLVED COBALT (CO) (UG/L)	TOTAL COPPER (CU) (UG/L)	SUS-PENDED COPPER (CU) (UG/L)	DIS-SOLVED COPPER (CU) (UG/L)	TOTAL LEAD (PB) (UG/L)	SUS-PENDED LEAD (PB) (UG/L)	DIS-SOLVED LEAD (PB) (UG/L)
JUNE 19...	0	0	1	37	29	8	17	17	0
SEP. 19...	0	0	0	15	9	6	22	9	13

DATE	TOTAL MERCURY (HG) (UG/L)	SUS-PENDED MERCURY (HG) (UG/L)	DIS-SOLVED MERCURY (HG) (UG/L)	TOTAL SELE-NIUM (SE) (UG/L)	SUS-PENDED SELE-NIUM (SE) (UG/L)	DIS-SOLVED SELE-NIUM (SE) (UG/L)	TOTAL ZINC (ZN) (UG/L)	SUS-PENDED ZINC (ZN) (UG/L)	DIS-SOLVED ZINC (ZN) (UG/L)
JUNE 19...	.3	.0	.3	4	3	1	10	0	10
SEP. 19...	.2	.1	.1	6	0	6	10	3	7

RADIOCHEMICAL ANALYSES

DATE	DIS-SOLVED GROSS ALPHA AS U-NAT. (UG/L)	SUS-PENDED GROSS ALPHA AS U-NAT. (UG/L)	DIS-SOLVED GROSS BETA AS CS-137 (PC/L)	SUS-PENDED GROSS BETA AS CS-137 (PC/L)	DIS-SOLVED GROSS BETA AS SR90/Y90 (PC/L)	SUS-PENDED GROSS BETA AS SR90/Y90 (PC/L)	DIS-SOLVED RA-226 (RADON METHOD) (PC/L)	DIS-SOLVED URANIUM (U) (UG/L)
FEB. 14...	<.9	2.0	3.0	1.7	2.6	1.5	.05	.06
AUG. 20...	<.5	<.5	2.0	<.5	2.2	<.5	.05	.03

PHYTOPLANKTON

	PERCENT COMPOSITION										
GENERA	OCT. 16	NOV. 11	DEC. 12	JAN. 24	FEB. 14	APR. 16	MAY 17	JUNE 16	JULY 23	AUG. 20	SEPT. 19
ACHNANTHES	--	--	--	--	19	--	--	--	--	--	--
ACTINASTRUM	--	--	--	--	--	--	--	2	--	--	--
AGMENELLUM	--	--	--	--	--	--	--	17	63	17	--
ANACYSTIS	--	--	--	15	--	--	--	--	--	--	--
ANKISTRODESMUS	--	--	--	--	--	--	8	2	--	--	--
CHLAMYDOMONAS	--	--	--	--	--	--	--	--	--	--	2
COCCONEIS	--	--	--	--	--	--	--	--	3	--	--
CRUCIGENIA	--	--	--	--	--	--	--	35	--	--	--
CYCLOTELLA	--	--	--	--	--	15	23	9	11	21	31
GLENODINIUM	--	--	--	--	--	--	--	--	2	4	--
KIRCHNERIELLA	--	--	--	--	--	--	--	--	1	4	2
LYNGBYA	--	--	--	23	--	--	--	--	--	--	--
MELOSIRA	20	24	43	--	28	50	15	9	11	21	60
NAVICULA	--	--	--	38	--	--	8	--	1	4	--
NITZSCHIA	--	--	--	--	--	--	8	2	--	8	--
SCENEDESMUS	--	--	--	--	--	--	30	22	8	17	--
SELENASTRUM	--	--	--	--	22	--	--	--	--	--	--
SCHROEDERIA	--	--	--	--	--	--	8	--	--	4	--
SYNEDRA	--	--	--	15	--	--	--	--	--	--	2
TRACHELOMONAS	27	48	28	--	--	--	--	2	--	--	--
UROGLENOPSIS	--	--	--	--	--	--	--	--	--	--	2
TOTAL	47	72	71	91	69	65	100	100	100	100	99

Source: U.S. Geological Survey, 1974; 1975; 1977.

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Table B.W.11. Alabama River Water Quality Data, Station M6 (Quarry Site)

Parameters	Storet No.	Date and Time 4-19-77 --	 6-2-77 10:50	 6-29-77 11:20	 7-27-77 08:10
T-PO_4 (mg P/l)	00665	--	<0.02	<.02	0.069
O-PO_4 (mg P/l)	00671	--	0.014	0.008	0.017
TKN (mg N/l)	00625	--	0.23	0.23	0.89
NH_3 (mg N/l)	00610	--	0.06	0.03	0.08
NO_2-NO_3 (mg N/l)	00630	--	0.26	0.226	0.209
BOD_5 (mg/l)	00310	--	<1.0	<1.0	<1.0
TOC (mg/l)	00680	--	1.6	4.7	4.1
Temperature (°C)	00010	--	27.0	30.0	29.7
Sp. Cond (umhos/im)	00094	--	152.0	133.0	102
TS (mg/l)	00500	--	100.0	104.0	94
TDS (mg/l)	70300	--	85.0	92.0	84
SS (mg/l)	00530	--	15.0	12.0	10
Turbidity (NTU)	00076	--	17.0	15.0	15
Color (CPU)	00080	--	20.0	25.0	25
Hardness (mg/l @ $CaCO_3$)	00900	--	38.0	80.0	84
Alkalinity (mg/l @ $CaCO_3$)	00410	--	32.0	34.4	17
pH	00400	--	6.6	6.8	7.8
DO (mg/l)	00299	--	8.5	8.2	7.1
DO (% saturation)	00301	--	105.0	108.0	93.4
Fecal Coliform (# cc/ml)	31616	--	16.0	10.0	120
Fecal Streptococci (# cc/ml)	31679	--	1,400.0	180.0	98
FC/FS	--	--	0.01	0.06	1.22
Cl^-	00940	--	5.0	--	--
$SO_4^=$	00945	--	9.7	9.9	6.2
Chlorophyll A (mg/m^3)		--	3.79	5.38	1.63
Iron (ug/l)	01045	--	360.0	341.0	619
Lead (ug/l)	01051	--	--	--	<3.0
Mercury (ug/l)	71900	--	--	--	<0.08

Source: Environmental Science and Engineering, Inc., 1977.

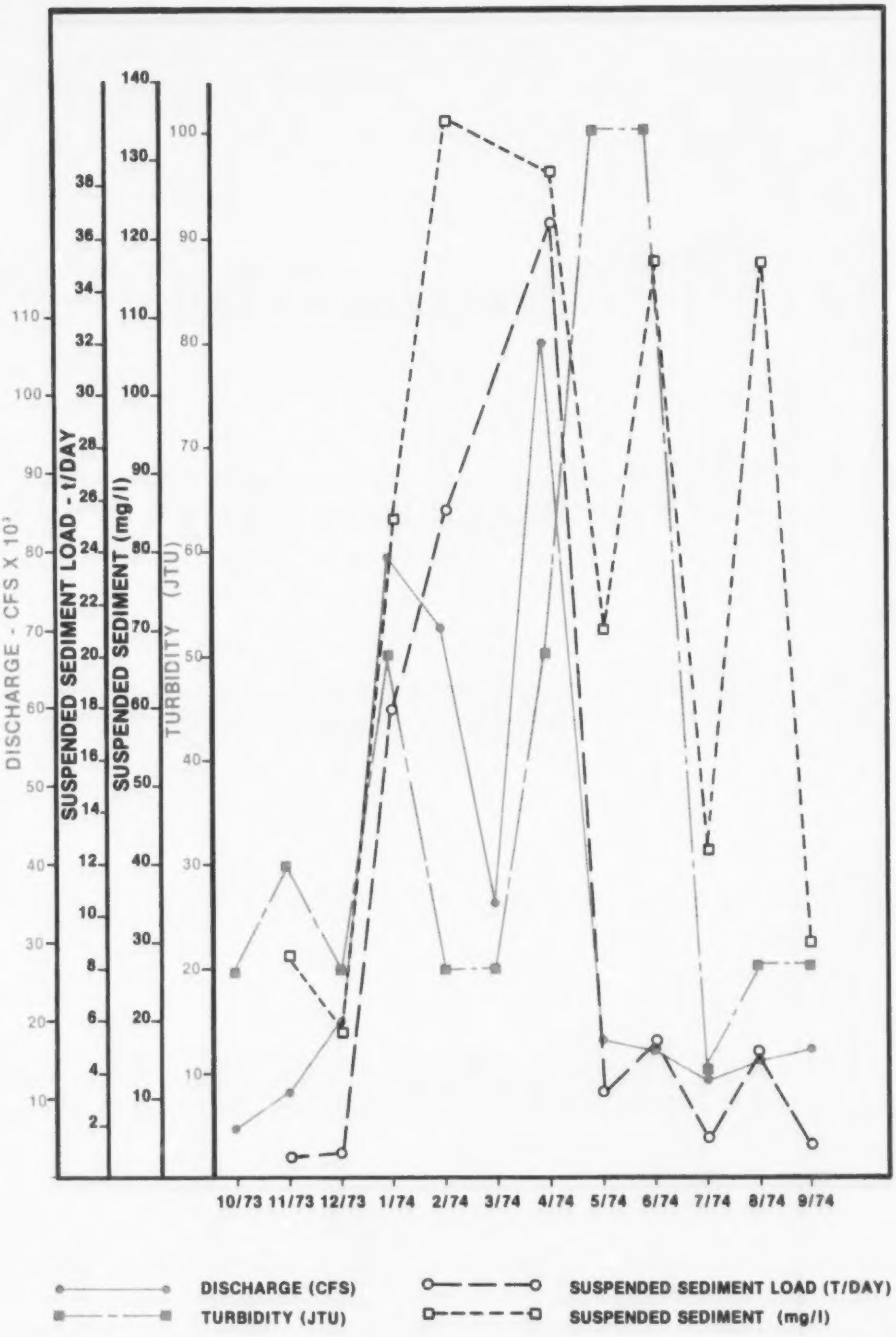

Figure B.W.16
ALABAMA RIVER FLOW, TURBIDITY, AND SUSPENDED SEDIMENTS

SOURCE: USGS, 1974.
Environmental Science and Engineering, Inc., 1977.

REGION IV
U.S. ENVIRONMENTAL PROTECTION
AGENCY ENVIRONMENTAL IMPACT
STATEMENT FOR IDEAL BASIC INDUSTRIES

PROPOSED GAILLARD QUARRY
MONROE COUNTY, ALABAMA

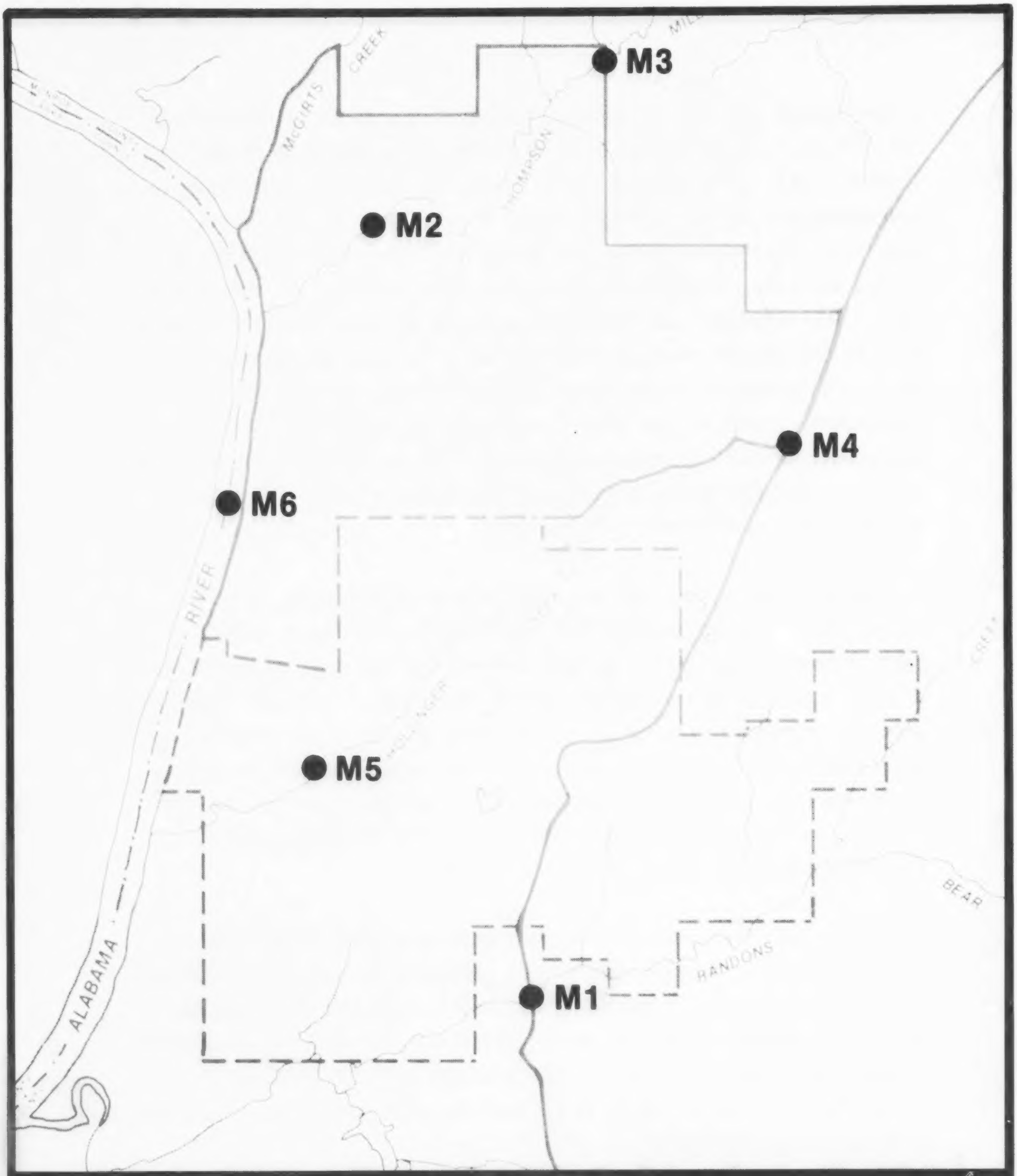
M3
M2
M4
M6
M5
M1
McGIRTS
CREEK
THOMPSON
MILL
RIVER
ALABAMA
HOLLINGER
CREEK
BEAR
RANDONS

Figure B.W.17
WATER SAMPLING NETWORK

0 0.5 1
SCALE IN KILOMETERS

SOURCE: Environmental Science and Engineering, Inc., 1977.

REGION IV
U.S. ENVIRONMENTAL PROTECTION
AGENCY ENVIRONMENTAL IMPACT
STATEMENT FOR IDEAL BASIC INDUSTRIES

PROPOSED GAILLARD QUARRY
MONROE COUNTY, ALABAMA

Comparison of the plot of average monthly flows of the Alabama River (see Figure B.W.16) and the plot of monthly instantaneous flows for October, 1973, to September, 1974, indicates that this water year was representative of the average monthly flow pattern of the river. Peak flow rates occur during the snowmelt of late winter and early spring and then rapidly fall to minimum flow rates in the summer and fall. The turbidity and suspended sediment patterns observed in 1973 to 1974 are typical Alabama River values. The mass movement of suspended sediments in the river closely follows the rate of flow. Consequently, most of the annual suspended sediment load is transported during the winter-spring maximum flow period. Thirty-seven to sixty-six percent of these suspended sediments are less than 0.062 millimeters (0.0024 inches) in diameter.

Turbidity in the river does not correlate with flow rate. Maximum turbidities (greater than 75 NTU) occur during the low flow period in early summer. A possible explanation could be the greater incidence of high intensity thunderstorms during this time of the year combined with the intensive plowing and cultivating of spring and summer crops within the river basin. Suspended sediment concentrations do not correlate with turbidity during the winter-spring-summer wet season. However, during the late summer-early fall, low flow dry period, turbidity and suspended solids are both low.

Specific conductivity appears to vary inversely with river flow, possibly because the rapid influx of low conductivity rainwater into the river during the wet season. Preliminary analysis of all other water quality parameters listed in Table B.W.11 does not provide discernible trends. With the exception of the turbidity and suspended solids loads discussed above, there is no evidence of a severe water quality problem in the Alabama River.

Thompson Mill Creek (Marshalls Creek)

Thompson Mill Creek (Marshalls Creek) is the northernmost permanent stream draining the quarry property. Like Hollinger and Randons creeks, Thompson Mill Creek flows in a southwesterly direction. Rising in Section 8, Range 6 East, Township 6 North, just south of U.S. Highway 84, Thompson Mill Creek flows some 9.3 kilometers (5.8 miles) and empties into the Alabama River about 1 kilometer (0.6 mile) north of the proposed dock site. For roughly half of its total length the creek is intermittent, flowing only during the wetter times of the year.

The Thompson Mill Creek watershed, which is roughly 1.3 kilometers (0.8 miles) wide and 10 kilometers (6 miles) long, comprises approximately 1,777 hectares (4,392 acres) and is characterized by rolling hills and deep, narrow valleys. Elevations near the headwaters approach 90 meters (300 feet) above msl. The average slope of the stream is 0.97 percent, the steepest of the three creeks draining the quarry property. In the lower reaches of the creek, the stream bed is made up of gravel and limerock and the stream banks are very steep, rising almost vertically from the edge of the narrow floodplain. Limerock outcrops are prevalent along the southern bank of the creek. Several springs also discharge along the steep banks, the result of ground water moving laterally over a dense impermeable layer of Yazoo clay.

Land within the Thompson Mill Creek watershed is primarily in pasture and native woodland. Timber harvesting is currently occurring in the lower portion of the watershed, whereby more pastureland is being developed.

A baseflow measurement was made approximately 1 kilometer (0.6 miles) upstream from the confluence with the Alabama River at Station M2 (see Figure B.W.17). On June 29, 1977, base flow was observed to be 75 liters per second (2.65 cfs), and a yield of 4.37 liters per second per square kilometer (0.40 cfs per square mile) was calculated.

Water quality data for April 15, June 2, June 29, and July 27, 1977, are presented in Table B.W.12. During baseflow conditions, this creek has very low turbidity (less than 3.6 JTU) and suspended solids (less than 5.6 mg/l); very low biochemical oxygen demand (less than 1.2 mg/l), total organic carbon (less than 6.9 mg/l), and color (less than 5.0 CPU); low orthophosphate and total phosphate; low ammonia (less than 0.04 mgN/l); low total Kjeldahl nitrogen (less than 0.16 mgN/l); low sulfate (less than 5.0 mg/l); moderately high nitrate-nitrite (0.74 to 1.58 mgN/l); and moderately high hardness (greater than 103 mg/l as calcium carbonate) and alkalinity (greater than 92.0 mg/l calcium carbonate). These data confirm that the stream and its watershed are in a natural state and that there are no major sources of organic contamination or erosion within the watershed. Low chlorophyll a and dissolved oxygen levels near saturation indicate high water quality. The higher values for hardness, alkalinity, nitrate- nitrite, specific conductance, and total dissolved solids are typical of waters which have extensive contact with limestone formations both underground and in the streambed. Temperature data indicate that the extensive tree canopy effectively shades the creek bed.

Hollinger Creek

Hollinger Creek is a small stream which flows southwest through the central portion of the proposed quarry property, emptying into the Alabama River approximately 2.4 kilometers (1.5 miles) south of the proposed dock. The creek rises in Sections 13 and 24, Township 6 North, Range 5 East (see Figure B.W.17) and flows approximately 6.4 kilometers (4 miles) before joining the Alabama River. For the first 2.7 kilometers (1.7 miles), Hollinger Creek is intermittent, flowing only during wet periods of the year.

The Hollinger Creek watershed comprises some 874 hectares (2,160 acres) of rolling hills used primarily for pastureland. The

Table B.W.12. Thompson Mill Creek (Marshalls Creek) Water Quality Data: Station M2

Parameters	Storet No.	Date and Time 4-19-77 12:25	6-2-77 7:15	6-29-77 10:50	7-27-77 09:05
T-PO_4 (mg P/l)	00665	0.07	<0.02	<0.02	0.069
O-PO_4 (mg P/l)	00671	0.013	0.006	0.011	0.021
TKN (mg N/l)	00625	0.16	0.04	0.03	<0.02
NH_3 (mg N/l)	00610	<0.03	0.04	0.03	0.04
NO_2-NO_3 (mg N/l)	00630	0.89	0.96	1.58	0.739
BOD_5 (mg/l)	00310	1.2	<1.0	<1.0	<1.0
TOC (mg/l)	00680	<1.0	<1.0	1.8	6.9
Temperature (°C)	00010	18.0	19.3	24.5	23.7
Sp. Cond (umhos/im)	00094	180.0	305.0	202.0	191
TS (mg/l)	00500	119.0	140.0	143.0	133
TDS (mg/l)	70300	114.0	134.0	140.0	130
SS (mg/l)	00530	5.0	5.6	<5.0	<5.0
Turbidity (NTU)	00076	3.4	3.6	0.9	1.2
Color (CPU)	00080	5.0	<5.0	5.0	5.0
Hardness (mg/l @ $CaCO_3$)	00900	103.0	104.0	120.0	130
Alkalinity (mg/l @ $CaCO_3$)	00410	111.0	92.0	95.3	180
pH	00400	7.8	7.2	7.8	8.5
DO (mg/l)	00299	9.4	8.5	8.7	8.3
DO (% saturation)	00301	99.0	90.0	103.0	96.5
Fecal Coliform (# cc/ml)	31616	--	120.0	32.0	130
Fecal Streptococci (# cc/ml)	31679	--	1,200.0	1,300.0	170
FC/FS	--	--	0.10	0.02	1.31
Cl^-	00940	--	5.0	4.0	--
$SO_4^=$	00945	--	<5.0	<5.0	<5.0
Chlorophyll A (mg/m^3)		--	1.19	1.48	0.54
Iron (ug/l)	01045	--	107.0	<80.0	153
Lead (ug/l)	01051	--	--	--	<3.0
Mercury (ug/l)	71900	--	--	--	<0.08

Source: Environmental Science and Engineering, Inc., 1977.

watershed is roughly 6.4 kilometers (4 miles) long and about 1.6 kilometer (1 mile) wide. At the headwaters, elevations are approximately 55 meters (180 feet) above msl and drop to 3 meters near the mouth. The average slope is 0.81 percent. As the creek proceeds southwesterly and drains an increasingly larger area, the channel becomes more deeply incised into the easily erodible alluvial soils in the area. Near the mouth, bluffs as high as 24 meters (80 feet) occur on both banks (bluffs are usually higher on the southern bank). The streambed in the more downstream reaches of the creek consists primarily of gravel and sand, with occasional outcrops of limerock along the steep banks.

Land use within the Hollinger Creek watershed is restricted to native woodlands and pastureland. At present, approximately 35 to 40 percent of the basin remains in native timber. Most of this timber occurs at the extreme northern end of the watershed, along the eastern drainage, and near the mouth. Timber currently is being harvested and the land rooted and converted to improved pasture. Land is being cleared down to the streambeds and on slopes that exceed 20 percent. This activity is creating a very severe potential for erosion.

A baseflow measurement was made at Station M5 approximately 1.35 kilometers (0.84 miles) upstream from the confluence with the Alabama River. On June 29, 1977, the base flow was measured at 19 liters per second (0.67 cfs). A yield of 6.5 liters per second per square kilometer (0.23 cfs per square mile) was calculated.

Baseflow water quality data for Hollinger Creek are presented in Table B.W.13. Prior to July 27, 1977, the stream had very low turbidity (less than 3.3 NTU) and suspended solids (less than 5 mg/l); very low biological oxygen demand (less than 1.8 mg/l), total organic carbon (3.1 mg/l), and color (less than 5.0 CPU); low orthophosphate and total phosphate (less than 0.017 mgP/l and less than 0.09 mgP/l respectively); low ammonia (less than 0.08 mgN/l); moderate total Kjedahl nitrogen (less than 0.34 mgN/l); low sulfate (less than

Table B.W.13. Hollinger Creek Baseflow Water Quality Data: Station M5

Parameters	Storet No.	Date and Time 4-19-77 12:00	 6-2-77 8:25	 6-29-77 11:45	 7-27-77 10:00
T-PO_4 (mg P/l)	00665	0.07	<0.02	0.04	0.097
O-PO_4 (mg P/l)	00671	0.017	0.009	<0.002	0.013
TKN (mg N/l)	00625	0.07	0.17	0.34	1.6
NH_3 (mg N/l)	00610	0.07	0.08	0.05	0.14
NO_2-NO_3 (mg N/l)	00630	0.30	0.31	0.36	0.360
BOD_5 (mg/l)	00310	1.8	<1.0	<1.0	2.5
TOC (mg/l)	00680	<1.0	<1.0	3.1	11
Temperature (°C)	00010	21.0	20.0	27.8	25.1
Sp. Cond (umhos/im)	00094	169.0	378.0	280.0	270
TS (mg/l)	00500	120.0	150.0	179.0	195
TDS (mg/l)	70300	118.0	148.0	176.0	166
SS (mg/l)	00530	<5.0	<5.0	<5.0	29
Turbidity (NTU)	00076	3.3	1.2	2.0	12
Color (CPU)	00080	5.0	<5.0	5.0	10
Hardness (mg/l @ $CaCO_3$)	00900	11.3	124.0	144.0	168
Alkalinity (mg/l @ $CaCO_3$)	00410	93.8	114.0	130.0	130
pH	00400	7.2	7.0	7.7	8.3
DO (mg/l)	00299	9.0	8.3	7.6	6.5
DO (% saturation)	00301	100.0	90.0	96.0	77.3
Fecal Coliform (# cc/ml)	31616	--	87.0	12.0	1,600
Fecal Streptococci (# cc/ml)	31679	--	810.0	540.0	1,860
FC/FS	--	--	0.11	0.02	0.86
Cl^-	00940	--	3.0	4.0	--
$SO_4^=$	00945	--	<5.0	<5.0	<5.0
Chlorophyll A (mg/m^3)		--	1.45	2.60	1.10
Iron (ug/l)	01045	--	143.0	114.0	552
Lead (ug/l)	01051	--	--	--	<3.0
Mercury (ug/l)	71900	--	--	--	0.45

Source: Environmental Science and Engineering, Inc., 1977.

5.0 mg/l); low nitrate-nitrite (less than 0.36 mgN/l); and moderately high hardness (less than 144 mg/l as calcium carbonate) and alkalinity (less than 130 mg/l as calcium carbonate). These data indicate that there were no significant sources of organic pollution within the watershed and that extensive contact with limestone formations results in a buffered, hard water.

Temperatures of Hollinger Creek are higher than Thompson Mill Creek (Marshalls Creek). These higher temperatures reflect the lack of tree canopy over the streambed where pasture has been developed. Although much of the watershed has been converted to pasture and there is evidence of severe rill and gully erosion in the pasture, erosion did not have a noticeable effect on baseflow water quality prior to July 27, 1977. A 20-millimeter (0.8-inch) rainfall event on June 29 and 30, 1977, was monitored at Station M5 to determine hydrologic and water quality response. The storm event peak flow of approximately 0.113 cms (4 cfs) occurred 3 hours after rainfall commenced. Turbidity, suspended solids, biological oxygen demand, total phosphate, and orthophosphate in Hollinger Creek were increased by the storm runoff. The effects of the storm runoff on all other parameters were negligible.

The water quality degradation noted during this storm appears to be primarily due to erosion of lands which have been recently cleared and stumped. Direct observations of rill and gully formations verified the conclusion. However, storm event monitoring was not performed on any other watershed on the quarry site. Consequently, there are no baseline data on storm runoff water quality in a watershed that has not been impacted by clear cutting and conversion to improved pasture.

The observed storm was not of high intensity and it fell on dry, sandy soil that had not received its normal rainfall for the year. Consequently, it is anticipated that more severe erosion will occur when normal rainfall activity returns.

The results for July 27, 1977, baseflow water quality sampling contrast with previous results because of the effect of logging and land clearing operations upstream. Turbidity and suspended solids increased significantly over the previous sampling events from 3.3 NTU and less than 5 mg/l to 12 NTU and 29 mg/l, respectively. Nutrients and organic carbon concentrations also increased due to runoff from burned areas.

Randons Creek

Randons Creek is the southernmost of the creeks which drain the quarry site property. It is also the largest, draining some 14,323 hectares (35,394 acres). Randons Creek rises in Section 16, Range 7 East, Township 6 North, approximately 5 kilometers (3 miles) northeast of Frisco City, Alabama. The creek proceeds westerly for approximately 10 kilometers (6 miles) before turning to the southwest, paralleling Hollinger and Thompson Mill (Marshalls) creeks (see Figure B.W.17), and eventually joining Lovetts Creek before emptying into the Alabama River. The overall length of the creek is 25.4 kilometers (15.8 miles), with the first 2.9 kilometers (1.8 miles) classified as intermittent. The watershed averages 5.3 kilometers (3.3 miles) in width.

Randons Creek basin consists of rolling hills and plateaus dissected by relatively steep stream valleys. The bulk of the watershed supports native woodlands. Pastureland is scattered throughout the basin but is most concentrated in the southeastern portion of the watershed, around the community of Frisco City. Approximately one-half of this community is within the Randons Creek watershed.

Because of its large drainage area, Randons Creek is quite different from Thompson Mill (Marshalls) and Hollinger creeks. Along its nearly 26-kilometer (16-mile) length, the creek drops just over 120 meters (400 feet). Maximum elevations near the headwaters are approximately

126 meters (420 feet) above msl. The average slope of the stream is 0.49 percent, by far the lowest of the three creeks draining the property. Because of the lower slope, the stream bottom near the mouth is primarily sand and silty sand. In the lower portion of the basin, the floodplain is considerably wider than those of the other two streams, and the stream banks are not as steep.

A baseflow measurement was made at Station M1 approximately 3 kilometers (2 miles) upstream of the confluence with the Alabama River. On June 24, 1977, base flow was observed to be 1.23 cms (43.3 cfs), with a yield of 9 liters per second per square kilometer (0.82 cfs per square mile).

Water quality data for Randons Creek are presented in Table B.W.14. Alkalinity, hardness, conductivity, total dissolved solids, and pH values for Randons Creek are much lower than for Thompson Mill or Hollinger creeks. The lower values reflect the limited contact Randon Creek waters have with limestone in the watershed. Turbidity, suspended solids, and color values are higher in Randons Creek because of the influence of agricultural lands and Frisco City. No water quality problems were documented in the creek.

McGirts Creek

Part of McGirts Creek forms the northern boundary of the property and flows in a southwesterly direction into the Alabama River. The flow in McGirts Creek is intermittent.

McGirts Creek watershed comprises approximately 161 hectares (397 acres). However, only 30 hectares (73 acres) are within Ideal's property, and this area is primarily in native woodland.

Alabama Tributaries Nos. 1, 2, 3, and 4

Four small watersheds exist adjacent to the Alabama River between McGirts and Hollinger creeks (Figure B.W.11). They consist of steep

Table B.W.14. Randons Creek Baseflow Water Quality Data: Station M1

Parameters	Storet No.	Date and Time 4-19-77 10:15	 6-2-77 9:00	 6-29-77 10:15	 7-27-77 10:45
T-PO_4 (mg P/l)	00665	--	0.04	0.04	0.15
O-PO_4 (mg P/l)	00671	--	<0.002	<0.002	0.008
TKN (mg N/l)	00625	--	0.17	0.02	1.5
NH_3 (mg N/l)	00610	--	0.06	<0.03	0.03
NO_2-NO_3 (mg N/l)	00630	--	0.38	0.473	0.462
BOD_5 (mg/l)	00310	--	<1.0	<1.0	1.2
TOC (mg/l)	00680	--	<1.0	2.3	3.7
Temperature (°C)	00010	--	19.5	23.5	23.2
Sp. Cond (umhos/im)	00094	--	155.0	98.0	97.6
TS (mg/l)	00500	--	90.0	81.0	81
TDS (mg/l)	70300	--	78.0	78.0	75
SS (mg/l)	00530	--	12.0	<5.0	6.4
Turbidity (NTU)	00076	--	18.0	6.4	6.8
Color (CPU)	00080	--	15.0	10.0	15
Hardness (mg/l @ $CaCO_3$)	00900	--	48.0	58.0	88
Alkalinity (mg/l @ $CaCO_3$)	00410	--	40.0	45.0	42
pH	00400	--	6.5	7.0	7.2
DO (mg/l)	00299	--	8.5	8.0	7.7
DO (% saturation)	00301	--	92.0	94.0	88.5
Fecal Coliform (# cc/ml)	31616	--	<2.0	160.0	270
Fecal Streptococci (# cc/ml)	31679	--	112.0	760.0	1,270
FC/FS	--	--	<0.02	0.21	0.21
Cl^-	00940	--	4.0	4.0	3.7
$SO_4^=$	00945	--	<5.0	<5.0	<5.0
Chlorophyll A (mg/m^3)		--	1.36	0.93	0.38
Iron (ug/l)	01045	--	903.0	681.0	752
Lead (ug/l)	01051	--	<3.0	<3.0	<3.0
Mercury (ug/l)	71900	--	--	--	0.37

Source: Environmental Science and Engineering, Inc., 1977.

ravines which channel water directly to the river. They do not have defined channels, and during dry periods there is no water flow.

The largest of the watersheds is Alabama Tributary No. 2. This watershed is roughly circular in shape and drains over 40 hectares (100 acres). Average slope is 6.2 percent, though slopes as high as 25 percent exist along the southern wall of the ravine. Land within the watershed is primarily in native timber. Where slopes allow, particularly in the northern two-thirds of the basin, timber harvesting is occurring, and tree cover is less dense than along the ravine banks. One small area of pasture exists in the northeast corner of the watershed.

The Alabama Tributary No. 1 drains only 17 hectares (42 acres). Initial development of the proposed quarry site will occur within this watershed. Average slope is 7.5 percent, and steeper slopes exist along the ravine banks. Because of its steep slope, nearly the entire watershed consists of native timber. A small limestone quarry exists in the extreme northwest corner of the basin.

The watershed of Alabama Tributary No. 3 is slightly less steeply sloped than in Tributaries 1 and 2, especially in the southern part of the watershed. Land use within the watershed is mostly in native woodland.

The watershed of Alabama Tributary No. 4 actually consists of two small watersheds. Both watersheds are adjacent to the Alabama River but one lies north of the mouth of Thompson Mill Creek (Marshalls Creek) and the other lies to the south. The topography in Alabama Tributary No. 4 watershed is similar to that in the Alabama Tributary No. 1 and No. 2 watersheds. The watershed lacks a definite channel and is mostly in native woodland.

No water quality data were collected from these tributaries or from McGirts Creek, and no historical data are available. Streams 1 and 2 were flowing in June, 1977, as a result of inflow from several springs and seeps in the watersheds. Water quality is expected to be similar to that observed in Thompson Mill Creek or in ground waters flowing from limestone bearing strata. The water would be highly buffered and moderately hard. Inorganic nitrogen, from geological sources, could be high. Suspended solids, total and orthophosphates, color, sulfates, and chlorophyll _a_ should all be low.

PROJECTED 1992 ENVIRONMENT

Alabama River

The navigation project below Claiborne was completed to authorized channel configurations and depths in 1975-1976. No plans to improve this system are active at this time. The Corps of Engineers has undertaken a restudy of extending the barge canal upstream to Rome, Georgia, by constructing locks on existing dams on the Coosa River. A multiple-purpose water resource study and additional work in the interest of flood control, power generation, navigation, and other uses, has also been completed by the Corps. Resubmission of proposed projects is pending expression of further interest by local proponents.

Annual maintenance of the navigation channel will be required in late spring to remove sedimentation because of winter and spring floods. Minor bank stabilization projects and training dikes will be constructed in a continuing attempt to control shoaling. However, no major projects are planned for the Alabama-Mobile River system below Claiborne Lock.

No navigation or flood control projects are planned. Consequently, except for shoaling and maintenance dredging, there should be no change in the circulation and hydrology of the Alabama River. Spring floods will continually modify the banks and channels of the river. Water quality in the river may deteriorate as lands upstream are cleared for agriculture and converted into urban regions.

Thompson Mill Creek (Marshalls Creek)

Extensive land clearing started in 1977 to harvest timber resources and to develop improved pasturelands within part of the watershed. The extent of these activities cannot be precisely projected to the year 1992. However, the timber management plan on file with the Soil Conservation Service does indicate that substantial areas of forest will be cleared within the Thompson Mill (Marshalls) watershed. If land management practices similar to those being followed in the Hollinger Creek watershed are implemented in the Thompson Mill Creek watershed, there will be a significant long-term change in baseflow water quality. Water temperatures will increase because of reduced forest canopy; specific conductivity, total dissolved solids, and alkalinity will increase as a result of higher rates of soil leaching and erosion from rainfall runoff; and ammonia and total Kjeldahl nitrogen will increase as a result of higher rates of erosion and export of organic detritus and cattle wastes. Short-term impacts on the creek will be severe because of erosion caused by runoff from cleared lands on steep slopes that are neither revegetated nor stabilized. Observations on Hollinger Creek indicate that short-term erosion and sediment impacts resulting from land clearing are reversible if the land surface is properly stabilized.

Hollinger Creek

Over 90 percent of the Hollinger Creek watershed will be converted to improved pasture by 1992. Since much of this land will be on steep slopes, it is probable that substantial erosion will occur. If this erosion is not prevented or controlled, long-term water quality degradation in Hollinger Creek will occur.

Randons Creek

Projections of development within the Randon Creek watershed are not available. However, it is anticipated that Frisco City will continue to expand into the watershed and that additional land will be cleared for agriculture. These activities will increase the nonpoint loads on the creek and will have an undefined detrimental effect on water quality.

Only 4 percent of the proposed quarry property is located within Randons Creek watershed. Consequently, future timber and land management practices on the property should have minimal impact on Randons Creek.

Alabama Tributaries No. 1 and 2

Logging operations have taken place in these watersheds and probably will continue in the future. Because slopes are steep and short, land disturbance will result in substantial erosion. Eroded sediments will be transported into the Alabama River very quickly. Once logged, these steep slopes will be difficult to stabilize. Consequently, it is probable that uncontrolled logging practices, similar to current practices, will accelerate erosion of cleared lands and cause severe water quality degradation.

McGirts Creek and Alabama Tributaries No. 3 and 4

Both of these watersheds are presently native woodlands, but it is possible that they may be cleared and converted to pasture. As in the Alabama Tributary No. 1 and No. 2 watersheds, clearing of the land will result in substantial erosion. Unless the areas disturbed are stabilized, erosion will accelerate and cause severe water quality degradation.

APPENDIX B. BASELINE
ARCHAEOLOGY

PLANT SITE

Prior to an archaeological-historical investigation of the plant site, historic literature, topographic maps, aerial photographs, and previous site surveys pertaining to the area were reviewed. In addition, a review of the National Register of Historic Places indicated that no historic sites were located in the vicinity.

An on-site "walk-over" archaeological-historical survey was conducted under the supervision of Mr. N. Read Stowe, Archaeologist, University of South Alabama. All roads, ditches, creek banks, and cleared and eroding areas were investigated for possible features and artifacts. The vegetation was examined since calciphile vegetation in an otherwise acid soil is often an indicator of buried sites.

No archaeological or historical sites were recorded during the survey. Artifacts present on the site represent recent garbage that has been placed there in the last ten years.

QUARRY SITE

Prior to inspection of the quarry site, historical literature pertaining to the area was reviewed. In addition to the literature search, a review was made of previous archaeological surveys of the area on file at the University of South Alabama Archaeology Laboratory. The surveys on file established the locations of 56 archaeological sites dating from the Transitional-Paleo Indian Period to the Historic Period. Although none of the previous surveys or excavations conducted included the Ideal quarry site, they provided data for predicting the types of sites which might occur in the area, as well as the chronological framework for the region.

SURFACE SURVEY

Between July 12, 1977, and July 31, 1977, a "walk-over" surface survey was conducted at the quarry site. Stream banks, plowed fields, erosional ditches, recently logged areas, logging roads, and wooded areas were examined for archaeological/historical sites. A total of 15 sites, 8 archaeological and 7 historic, were recorded during the survey. Of the 15, only 2 were of special interest, Ideal Site Nos. 6 and 8 (see Figure B.A.Q.1).

Site No. 6 is located in the northwest quarter of the northwest quarter of section 22. The site is wooded, with varying amounts of underbrush. The soil is sandy with little gravel present. Approximate elevation of this site is 49 meters.*

Artifacts indicate a Mississippian site dating from about 1300 A.D. Historic ceramics on this site appear to indicate the presence of a late 19th century historic house:

1. Prehistoric:

   2 Quartzite Hammerstones
   1 Sandstone Scraper
   1 Burned Sandstone Rock

*Note: All data in this section are given only in metric units as is standard archaeological practice.

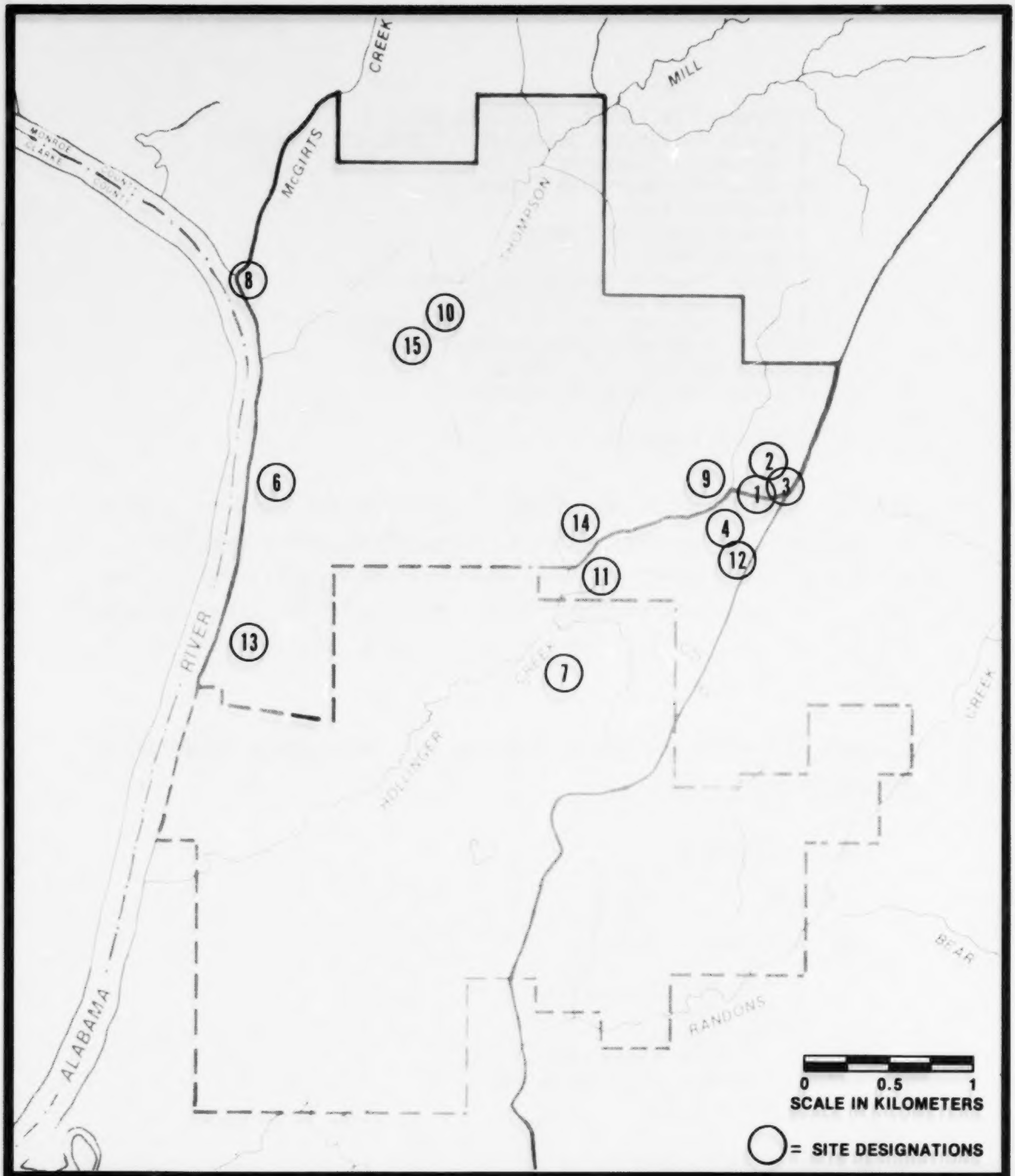
CREEK
MILL
MONROE COUNTY
CLARKE COUNTY
McGIRTS
THOMPSON
8
10
15
6
9
2
1
3
14
4
12
11
13
7
RIVER
CREEK
HOLLINGER
CREEK
ALABAMA
BEAR
RANDONS
0
0.5
1
SCALE IN KILOMETERS
= SITE DESIGNATIONS

Figure B.A.Q.1
ARCHAEOLOGICAL-HISTORICAL SURVEY OF IDEAL BASIC INDUSTRIES QUARRY SITE, PERDUE HILL, ALABAMA

SOURCE. University of South Alabama, Archaeological Research Laboratory, 1977.

REGION IV
U.S. ENVIRONMENTAL PROTECTION AGENCY ENVIRONMENTAL IMPACT STATEMENT FOR IDEAL BASIC INDUSTRIES

PROPOSED GAILLARD QUARRY
MONROE COUNTY, ALABAMA

1 Bifacial Tallahatta Quartzite Blade
2 Broken Tallahatta Quartzite P-1 Projectile Points
1 Tallahatta Quartzite P-1 Projectile Point Base
15 Tallahatta Quartzite Flakes
7 Quartzite Flakes
1 Broken Quartzite Pebble
1 Smooth Pebble
1 Shell Tempered Moundville Incised Sherd
1 Shell Tempered Incised Sherd
1 Shell Tempered Blackfilm Incised Sherd
3 Shell Tempered Blackfilm Plain Sherds
2 Sand Tempered Plain Sherds
13 Shell Tempered Plain Sherds

2. 2 Blue Transferware.

Site No. 8 is located in the southwest quarter of the southwest quarter of section 15, at an elevation of approximately 15 meters (see Figure B.A.Q.1). Situated on a limestone bluff at Dale Ferry Landing, the site is heavily wooded with oak, cedar, and underbrush. Limestone walls and foundations, as well as what appears to be a ferry crossing, are present on the site.

Recovered artifacts indicate a middle to late 19th century occupation of this site:

a. Prehistoric:

None

b. Historic:

1 Iron Pot (Bottomless)
2 Iron Rods
5 Iron Spikes
1 Stretched Chain Link
1 Iron Bar (Farm Implement)
1 Whole Brick.

EXCAVATION

Field work was performed from October 18, 1977, to November 2, 1977. The trees and brush in the area surrounding Site No. 1Mn57 were removed with a D-6 dozer to make the site more accessible. Then ten 2-meter and nine 1-meter squares were excavated to depths ranging from 10 centimeters (1 level) to 60 centimeters (6 levels). The excavation revealed three stratigraphic levels:

1. Zone A, a shallow loamy layer, extends from the surface to an average depth of 10 to 15 centimeters. Portions of Zone A have been disturbed by cultivation. Numerous artifacts were recovered from the cultivated area. In test pits outside the cultivated sector, Zone A is much thinner, with numerous roots and few artifacts.

2. Zone B, a light yellow-brown layer of sandy soil with scattered quartzite pebbles, extends from 15 to 60 centimeters below the surface. The soil gradually becomes more orange in color toward the bottom of this zone, as the proportion of clay increases. In squares excavated outside the cultivated area, this zone is often abbreviated and shows signs of erosion. Numerous artifacts were recovered from Zone B.

3. Zone C is a culturally sterile layer of orange-red clay encountered 50 to 60 centimeters below the surface. Excavation in the majority of the test pits was abandoned in Zone C.

Excavation revealed a number of artifacts, two features, and one burial. The artifacts recovered from Zone A included plow shares, medicine bottles, snuff cans, and a tractor seat. These were mixed with small aboriginal pot sherds and Tallahatta quartzite flakes. Analysis of these artifacts indicates a late prehistoric component extensively disturbed by early 20th century and, possibly, late 19th century cultivation. Zone B was relatively undisturbed and produced fewer historic artifacts. The prehistoric artifacts recovered from this level include an assortment of stone tools, projectile points, flakes, and spalls, as well as pottery sherds somewhat larger than the sherds in Zone A. Zone C yielded no artifacts.

Feature No. 1 was a dark brown circular stain in Square No. N2E14, first encountered at a depth of about 45 centimeters (level 5). The stain, approximately 19 centimeters in diameter, was 77 centimeters from the north profile and 91 centimeters from the east profile. It extended vertically, to an undetermined depth, from Zone B into the sterile zone which was encountered at the bottom of level 6. Inside the feature were small bits or charcoal, burnt sandstone, cracked quartzite pebbles, and a Tallahatta quartzite flake. The same square produced a large stemmed projectile point at a depth of 50 centimeters.

Feature No. 2 was a large, dark grey-brown, irregularly shaped stain in Square No. N59W30. The feature was encountered at a depth of about 15 to 20 centimeters and extended about 50 centimeters at the deepest point. This stain, approximately 160 centimeters across at the widest point, was apparently a late prehistoric pit intrusive into the yellow-brown sandy zone from the bottom of Zone A. The pit contained the largest concentration of prehistoric artifacts encountered. Shell-tempered, plain pottery was the most abundant ceramic type, although numerous large sherds of incised pottery were also recovered. Tallahatta quartzite flakes, a stemmed projectile point, and chunks of limestone were also excavated from Feature No. 2. This feature, which produced at least one partially restorable vessel, has been tentatively identified as a Mississippian refuse pit.

Burial No. 1 consisted of a fragmentary portion of a human skull encountered in Square No. S9E25. The skull, approximately 16 centimeters in diameter, was in a very poor state of preservation, and it was not possible to remove it intact. In all, 54 skull fragments and a human molar were recovered. The extremely friable bone was coated with a glue solution for preservation, and a limited amount of reconstruction was accomplished. There was no apparent pit and no artifacts recovered in direct association.

Artifacts were carried to the University of South Alabama Archaeological Laboratory, where they are presently undergoing analysis and identification. The artifacts have been classified into five categories and totaled.

Historic ceramics	212
Other historic	578
Aboriginal ceramics	784
Lithics	500
Organic	124
Total	2,197

Historic ceramics, making up 10 percent of the artifacts recovered, include such types as creamware, earthenware, stoneware, and porcelain. The "other historic" category, which includes all other historic artifacts such as glass, metal, and building material, accounts for 26 percent of the total. Many of the historic artifacts were picked up from the surface at Site No. 1Mn57 due to the recent component (e.g., rubber tire fragments, bottles, and wire nails).

Although a house location was found on Site No. 1Mn57 during the initial survey in August, 1977, the number of historic artifacts is misleading if taken at face value. Five of the ten 2-meter squares excavated were located in the area of the house site so that the historic component is over-represented. More accurately, the aboriginal component may be under-represented because the historical component is concentrated in a small area whereas the aboriginal component is spread out over the entire area surveyed. Aboriginal ceramics, which were the most abundant artifacts at the site, constitute over a third of the total recovered. Most of these were plain body sherds without any identifying characteristics other than tempering material.

The majority of the lithic materials recovered are composed of Tallahatta quartzite, a source of which can be found in nearby Clarke County, Alabama. The lithic evidence includes 29 assorted tools (blades, scrapers, hammerstones, cutting stones, etc.), 9 projectile points, and 4 steatite fragments (including one large steatite sherd).

The organic evidence includes bone, shell, charcoal, and nut shells. The 54 skull fragments from the burial account for about half of the organic count. The associations, prehistoric or historic, of all the organic remains have not yet been determined.

CONCLUSIONS

Site No. 1Mn57 is a multi-component site involving an historic house site, a Mississippian component, a Woodland component and an Archaic component.

The historic component, which was very evident over a large portion of the site, yielded numerous artifacts (many related to farming activities) of late 19th to early 20th century origin.

The Mississippian (late prehistoric) component was most obvious in Feature No. 2. It was less obvious in the area of cultivation with a few small shell-tempered sherds recovered in Zone A mixed with sand and clay tempered sherds and many historic artifacts. Evidently, much of the Mississippian component has been destroyed by cultivation and erosion.

The Woodland component was demonstrated by the number of large, stemmed projectile points, blade tools, sand and sand/clay tempered pottery. Portions of this component have also been disturbed by cultivation; however, the majority remains intact.

An archaic (pre-ceramic) component was indicated by the presence of steatite fragments, including a large steatite vessel sherd. This component may become more evident as work in the University of South Alabama Archaeological Laboratory continues.

Artifacts were scrutinized and placed in stratigraphic order to facilitate analysis, and artifact tables were compiled. The archaeologist's final report was submitted to the Alabama Historical Commission in

March, 1978, with a complete account of the required test excavations. This report included a discussion of the salvage activities and the approval of the Alabama Historical Commission is pending.